A319/A320/A321
TECHNICAL TRAINING MANUAL
SA Family to A319/A320/A321 CFM LEAP - T1+T2
36-PNEUMATIC

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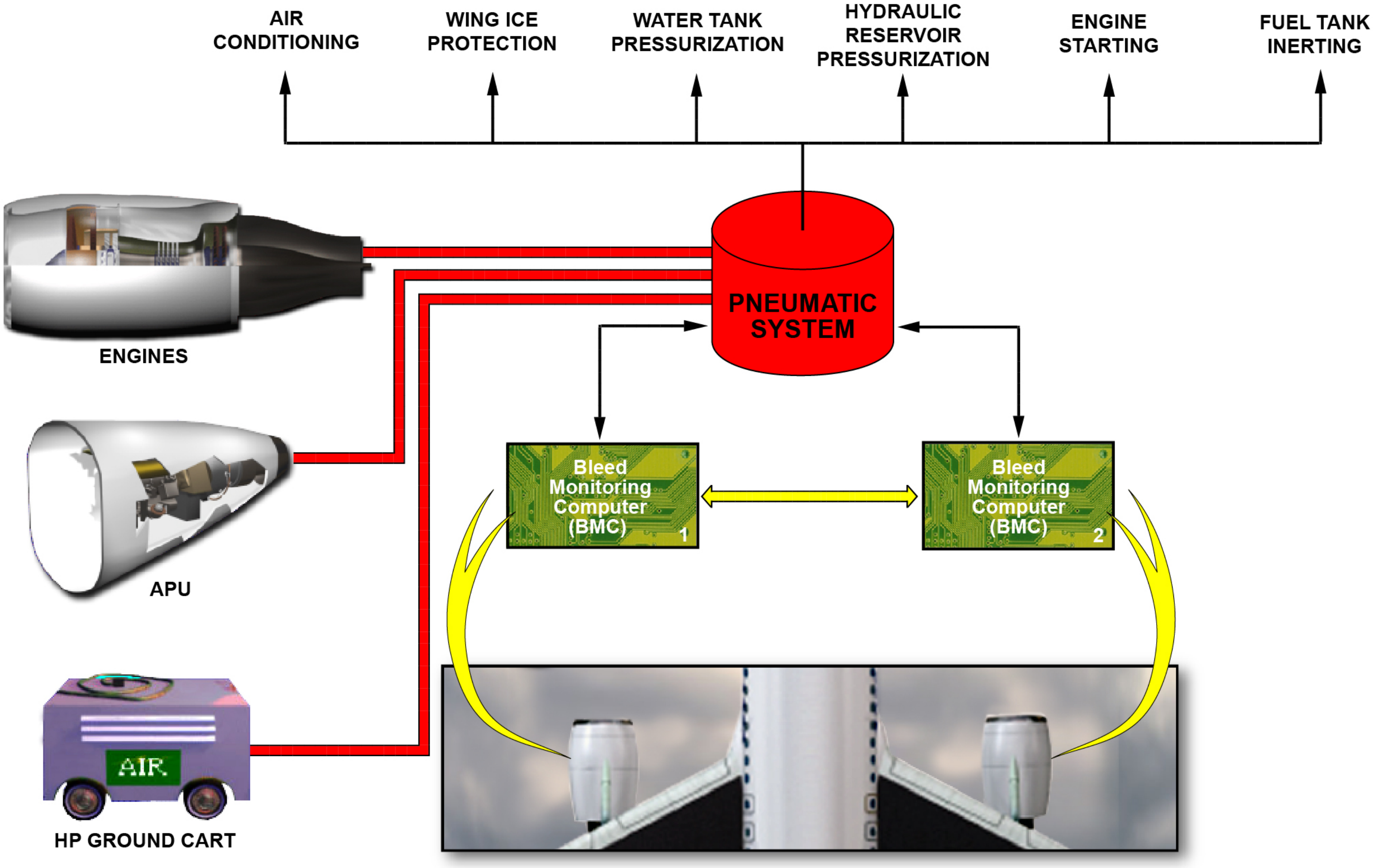
PNEUMATIC SYSTEM PRESENTATION

SYSTEM INTRODUCTION

The Airbus Single Aisle family pneumatic system supplies High Pressure (HP) air for:
- Air conditioning,
- Wing ice protection,
- Water Tank pressurization,
- Hydraulic reservoir pressurization,
- Engine starting,
- Fuel tank inerting system.

High Pressure air can be supplied from three sources:
- The Engine Bleed system,
- The APU,
- A HP Ground Air source.

The pneumatic system operates electro-pneumatically and is controlled and monitored by 2 Bleed Monitoring Computers (BMC 1 & 2).
There is one BMC for each engine bleed system.
Both BMCs exchange data.
In this NEO configuration, one BMC can control & monitor both sides when the other BMC fails.


AIR CONDITIONING
WING ICE PROTECTION
WATER TANK PRESSURIZATION
HYDRAULIC RESERVOIR PRESSURIZATION
ENGINE STARTING
FUEL TANK INERTING
PNEUMATIC SYSTEM
ENGINES
APU
HP GROUND CART
AIR
Bleed Monitoring Computer (BMC) 1
Bleed Monitoring Computer (BMC) 2

SYSTEM INTRODUCTION

PNEUMATIC SYSTEM PRESENTATION

SYSTEM INTRODUCTION (continued)

ENGINE BLEED

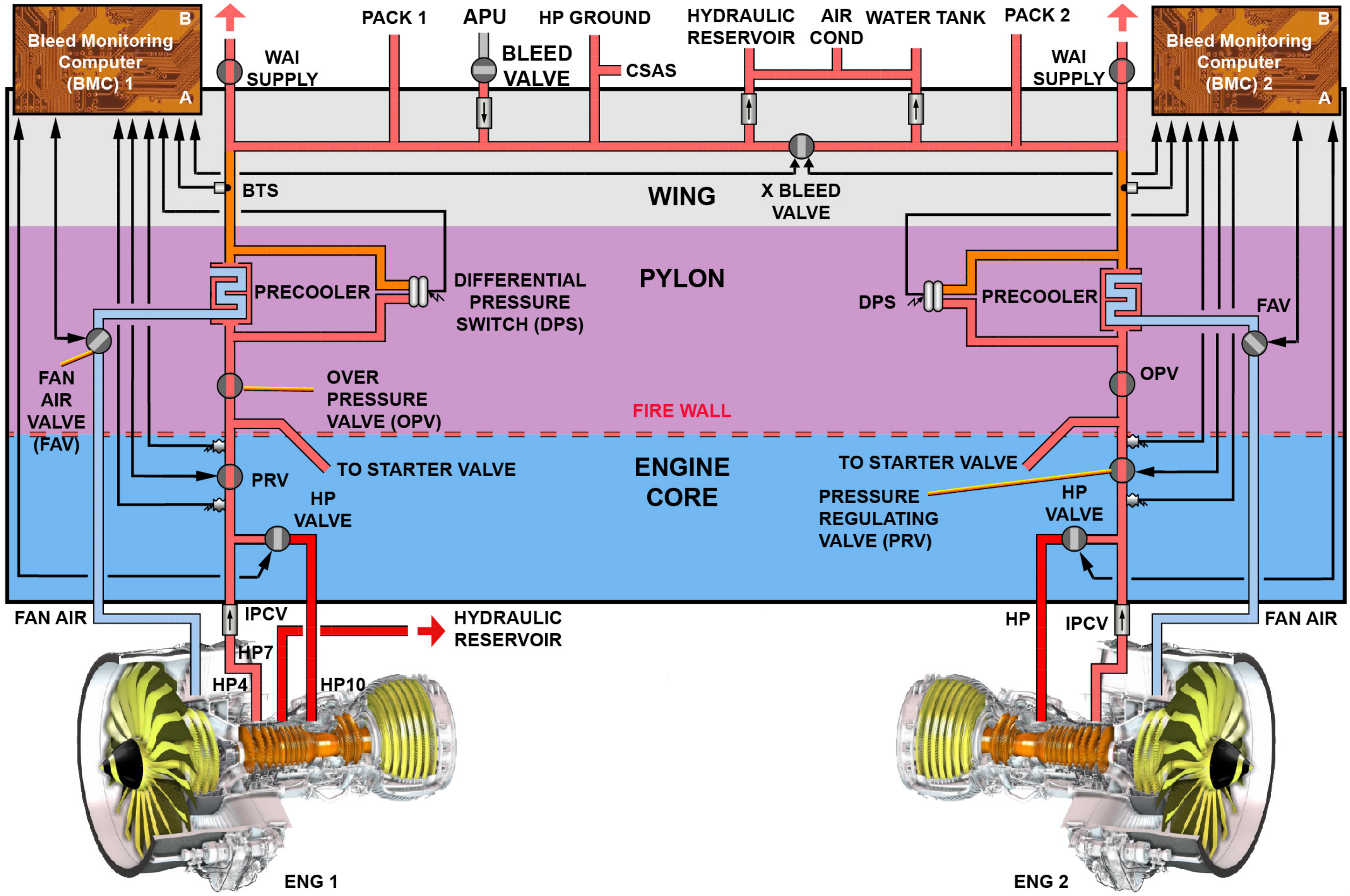
The Engine Bleed Air is pressure and temperature regulated before it supplies the pneumatic system.
Air is bled from an Intermediate Pressure (IP) stage (HP4) or the HP10 stage with the High Pressure Valve (HPV) which is used for the pneumatic regulation.
The IP check valve gives protection to the IP stage from reverse flow when the HP valve is open.

NOTE: Note: The Engine Bleed Air System (EBAS) uses electro-pneumatic valves.

The HP bleed is only used when the engines are at low power and for engine efficiency the High Pressure Valve (HPV) is kept closed during cruise.
The Pressure Regulating Valve (PRV) regulates the bleed air pressure.
The PRV is used as a protective shut off valve when the parameters are abnormal. In case of EBAS electrical failure, the PRV operates in back-up pneumatic mode.
An Overpressure Valve (OPV) is installed downstream of the bleed valve to give protection to the system if an overpressure condition occurs. On this CFM Leap Engine the OPV is installed in the pylon.
The Fan Air Valve (FAV) modulates Fan discharge air through an air-to-air heat exchanger called "Precooler" to reduce the Bleed temperature.
BMCs are Dual Channel computers. Each BMC channel A is a full digital channel embedding all the control and monitoring functions.
Channel B is a hardware part and back-up channel able to detect system overtemperature.
For the monitoring, the BMCs read pressure transducers (upstream / downstream of the PRV), Precooler Differential Pressure and downstream temperature with the Bleed Temperature Sensor (BTS).

APU BLEED/EXTERNAL AIR

The left and right bleed systems are connected by a crossbleed duct.
A Crossbleed Valve is used for their interconnection or isolation.
The APU is mainly used for bleed air supply on the ground for air conditioning and for engine start.
But APU BLEED air can also be used in flight, but limited in altitude.
The APU bleed supply is connected to the left side of the crossbleed duct.
On the ground, an HP Ground cart can be connected to the left side pneumatic system. The Crossbleed valve has to be opened to supply the right side.


Bleed Monitoring Computer (BMC) 1
B
A
WAI SUPPLY
PACK 1
APU
BLEED VALVE
HP GROUND
CSAS
HYDRAULIC RESERVOIR
AIR COND
WATER TANK
PACK 2
WAI SUPPLY
Bleed Monitoring Computer (BMC) 2
B
A
BTS
WING
X BLEED VALVE
PRECOOLER
DIFFERENTIAL PRESSURE SWITCH (DPS)
PYLON
DPS
PRECOOLER
FAV
FAN AIR VALVE (FAV)
OVER PRESSURE VALVE (OPV)
OPV
FIRE WALL
PRV
TO STARTER VALVE
ENGINE CORE
TO STARTER VALVE
PRESSURE REGULATING VALVE (PRV)
HP VALVE
HP VALVE
FAN AIR
IPCV
HP7
HP4
HP10
HYDRAULIC RESERVOIR
HP
IPCV
FAN AIR
ENG 1
ENG 2

SYSTEM INTRODUCTION - ENGINE BLEED & APU BLEED/EXTERNAL AIR

PNEUMATIC SYSTEM PRESENTATION

SYSTEM INTRODUCTION (continued)

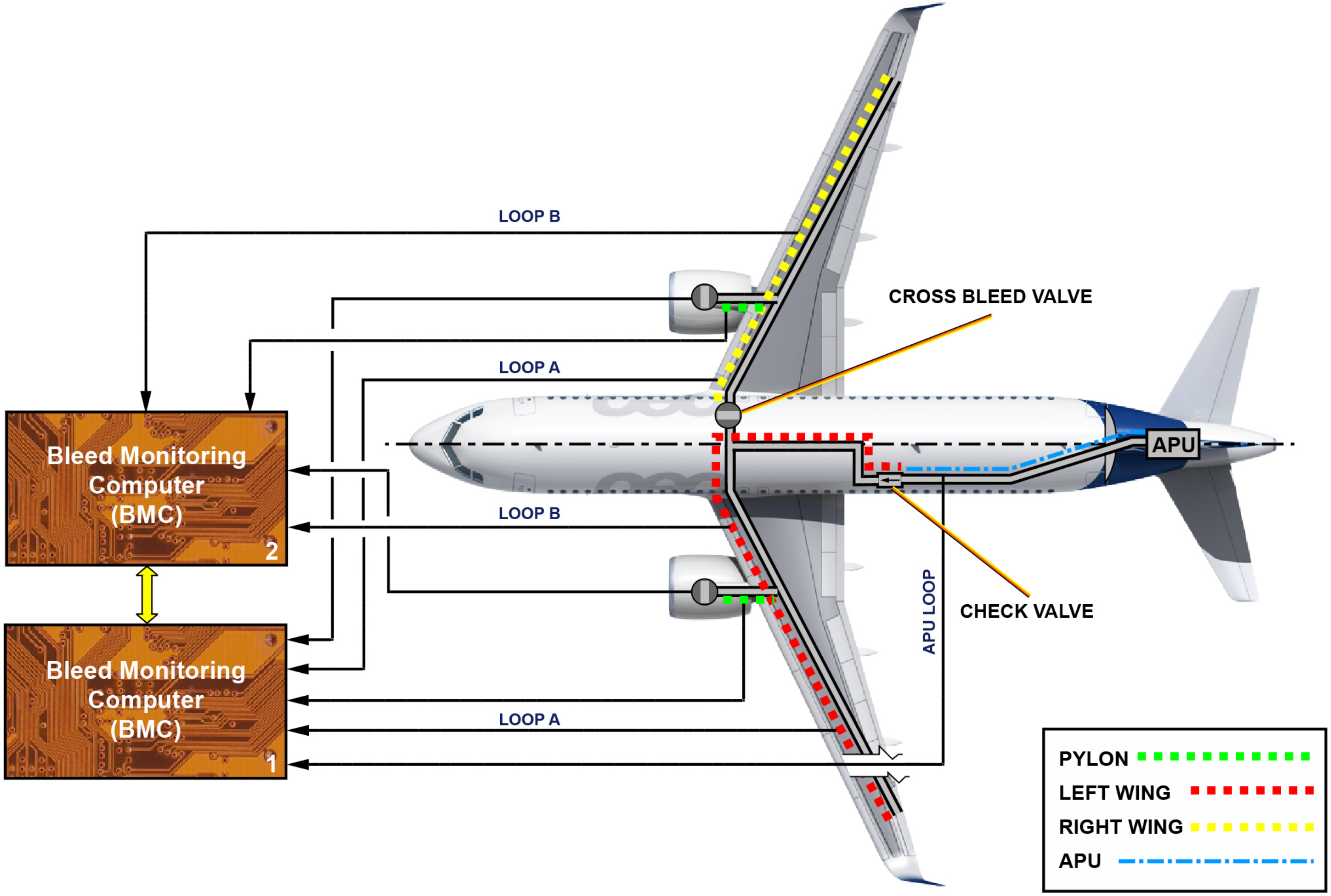
LEAK DETECTION

Leak detection loops are installed along the hot air supply ducts of the pneumatic system. The loops are made of multiple sensing elements connected in series to the BMCs Overheat Detection System (OHDS).

If a leak is detected, a signal is sent to the BMC 1 or 2 which automatically isolates the affected area by closing the crossbleed valve and shutting off the engine bleed on the affected side.

The leak detection system is organized into three loops. Here are the loops and the protected areas: - Pylon: dual loop from the precooler to the wing leading edge.

- Wing: dual loop from wing leading edge, including the wing air inlet supply, and belly fairing (cross bleed duct, pack supply ducts and APU forward supply duct).
- APU: single loop at APU aft supply duct (left hand side of the fuselage) from APU firewall to wheel well area.


LOOP B
LOOP A
LOOP B
LOOP A
CROSS BLEED VALVE
CHECK VALVE
APU LOOP
APU
Bleed Monitoring Computer (BMC) 2
Bleed Monitoring Computer (BMC) 1
PYLON
LEFT WING
RIGHT WING
APU

SYSTEM INTRODUCTION - LEAK DETECTION

PNEUMATIC SYSTEM PRESENTATION

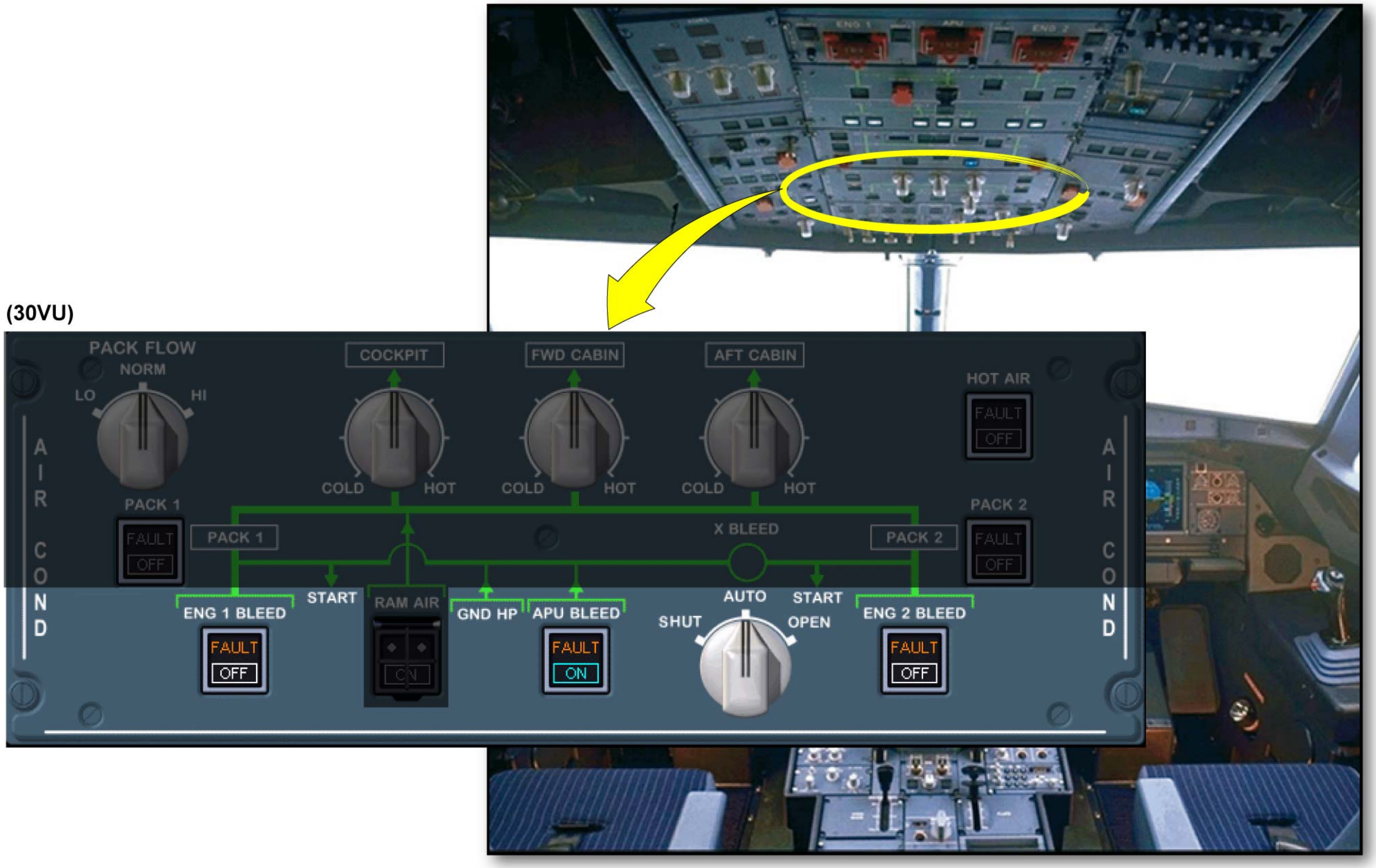
CONTROL & INDICATING

This section is related to the control panels and indications for the pneumatic system.

CONTROL PANEL

Controls for the pneumatic system are part of the AIR COND panel and are operated from the overhead panel.

(30VU)


PACK FLOW
NORM
LO
HI
PACK 1
COCKPIT
FWD CABIN
AFT CABIN
COLD
HOT
COLD
HOT
COLD
HOT
HOT AIR
FAULT
OFF
AIR COND
FAULT
OFF
PACK 1
X BLEED
PACK 2
PACK 2
FAULT
OFF
AIR COND
START
RAM AIR
ENG 1 BLEED
FAULT
OFF
ON
GND HP
APU BLEED
FAULT
ON
AUTO
SHUT
START
OPEN
ENG 2 BLEED
FAULT
OFF

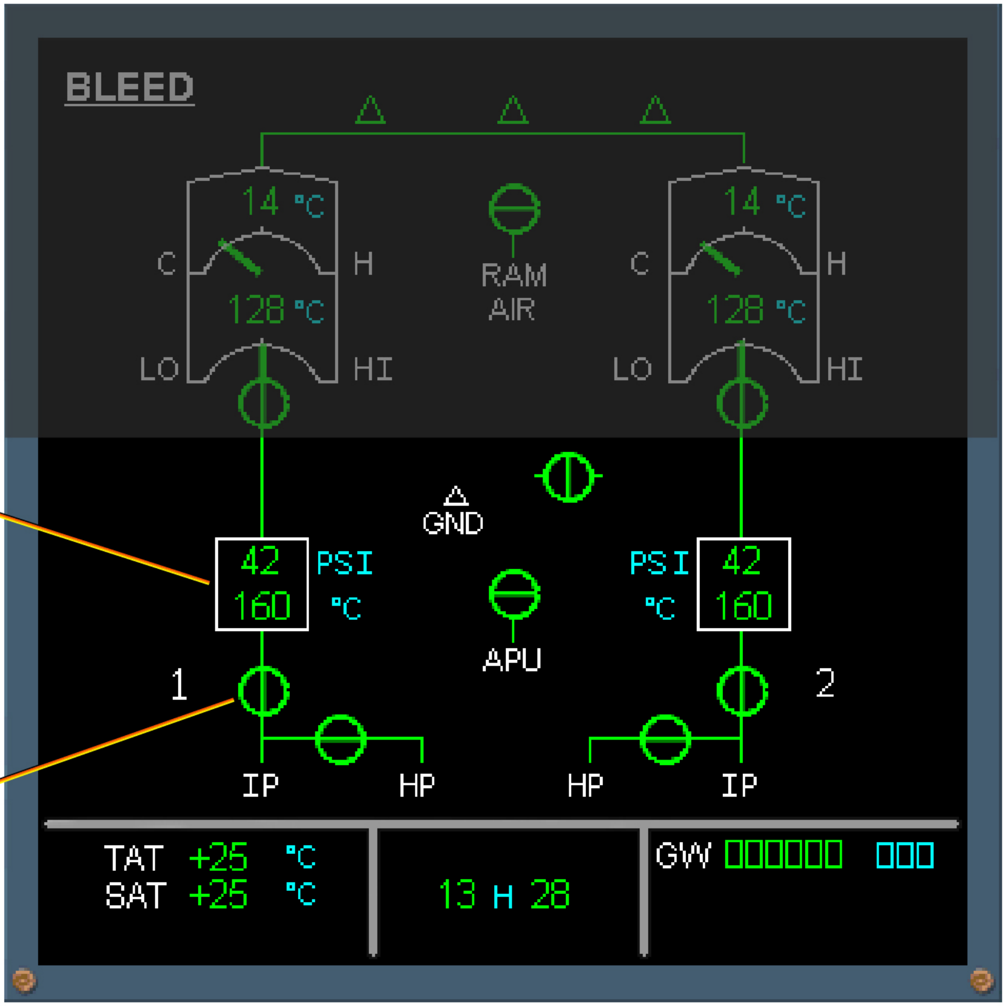
CONTROL & INDICATING - CONTROL PANEL

PNEUMATIC SYSTEM PRESENTATION

CONTROL & INDICATING (continued)

ECAM INDICATION

The pneumatic system indications are displayed on the lower part of the ECAM BLEED page:
- HPV, PRV positions with delivered bleed pressure and temperature,
- APU bleed and crossbleed status.


BLEED
14 °C
C
H
128 °C
LO
HI
RAM
AIR
GND
42
160
PSI
°C
APU
1
2
IP
HP
TAT +25 °C
SAT +25 °C
13 H 28
GW
PRESSURE AND TEMPERATURE INDICATIONS
BLEED VALVE POSITION

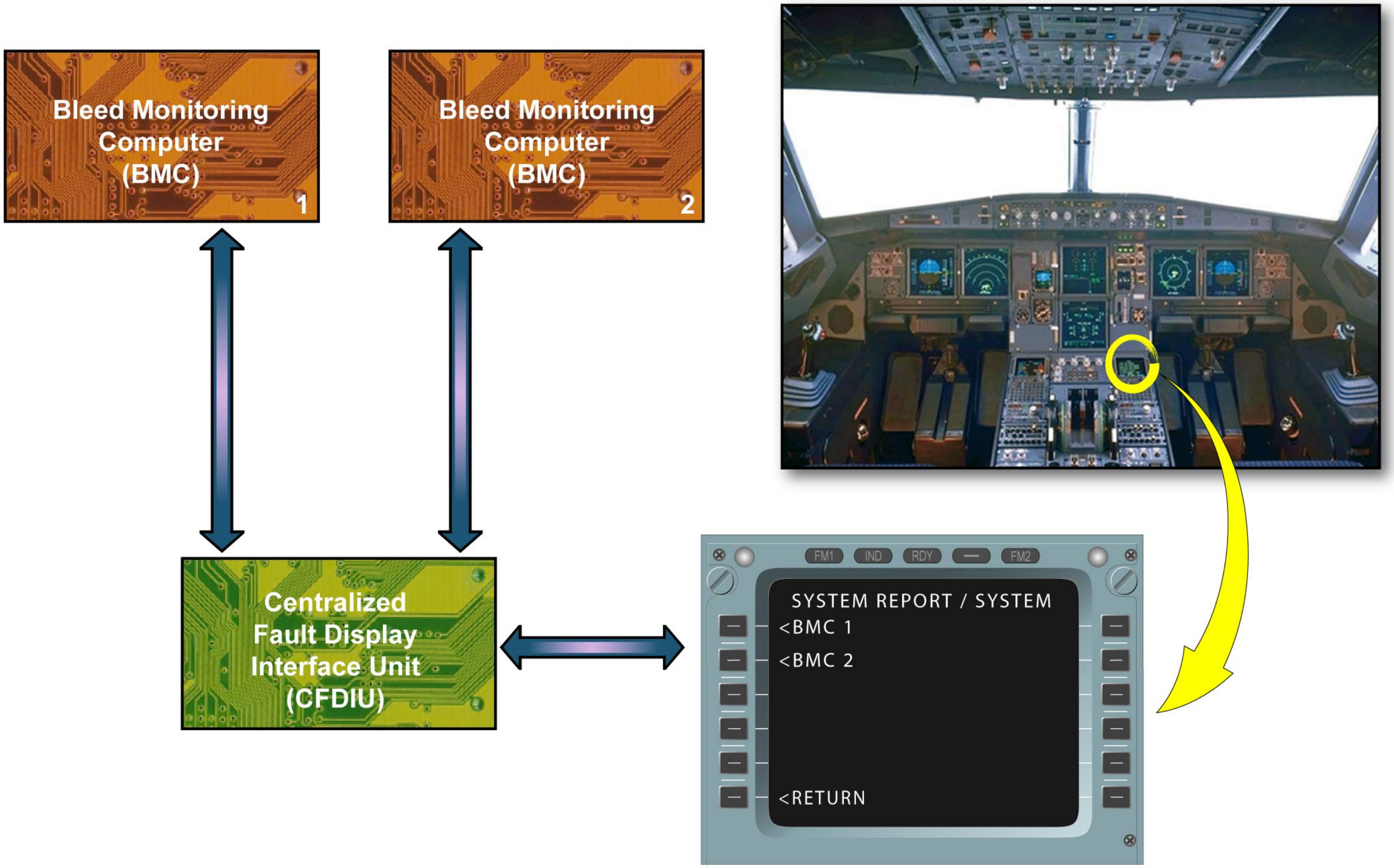
SD

CONTROL & INDICATING - ECAM INDICATION

PNEUMATIC SYSTEM PRESENTATION

MAINTENANCE/TEST FACILITIES

Using the Multipurpose Control and Display Unit (MCDU), you can have access to the Centralized Fault Display System (CFDS) fault messages of the PNEUMATIC system. BMC1 and BMC2 Built-In Test Equipment (BITE) is standard type 1.


Bleed Monitoring Computer (BMC) 1
Bleed Monitoring Computer (BMC) 2
Centralized Fault Display Interface Unit (CFDIU)
FM1
IND
RDY
FM2
SYSTEM REPORT / SYSTEM
<BMC 1
<BMC 2
<RETURN

MAINTENANCE/TEST FACILITIES

PNEUMATIC SYSTEM PRESENTATION

SAFETY PRECAUTIONS

When you do work on the aircraft, make sure that you obey all the Aircraft Maintenance Manual (AMM) safety procedures. This will prevent injury to people and / or damage to the aircraft. Here is an overview of the main safety precautions related to the pneumatic system.
Make sure that the pneumatic system is depressurized before you start the work. HP air can cause unwanted pressurization of the aircraft, and injury to personnel. Be careful when you do work on the engine components immediately after the engine shutdown. The engine components can stay hot for one hour.

WARNING

CAUTION

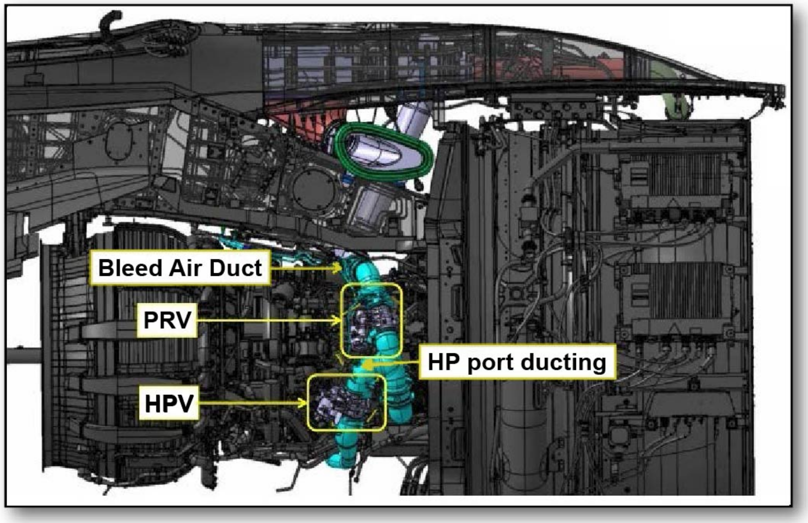
OBEY ALL THE AMM SAFETY PROCEDURES

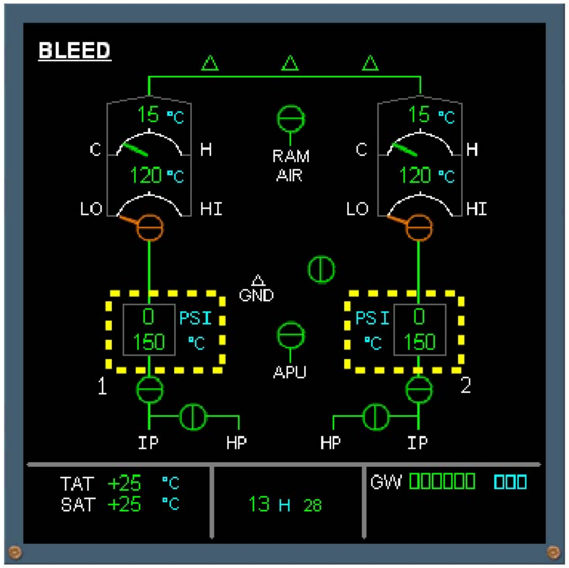
WARNING

PNEUMATIC SYSTEM MUST BE DEPRESSURIZED

CAUTION

PARTS CAN BE HOT FOR ONE HOUR AFTER ENGINE SHUTDOWN


Bleed Air Duct
PRV
HP port ducting
HPV


BLEED
15 °C
C
H
120 °C
LO
HI
RAM AIR
15 °C
C
H
120 °C
LO
HI
GND
0 PSI
150 °C
APU
PSI 0
°C 150
1
2
IP
HP
HP
IP
TAT +25 °C
SAT +25 °C
13 H 28
GW

SAFETY PRECAUTIONS

PNEUMATIC SYSTEM COMPONENT LOCATION

SYSTEM OVERVIEW

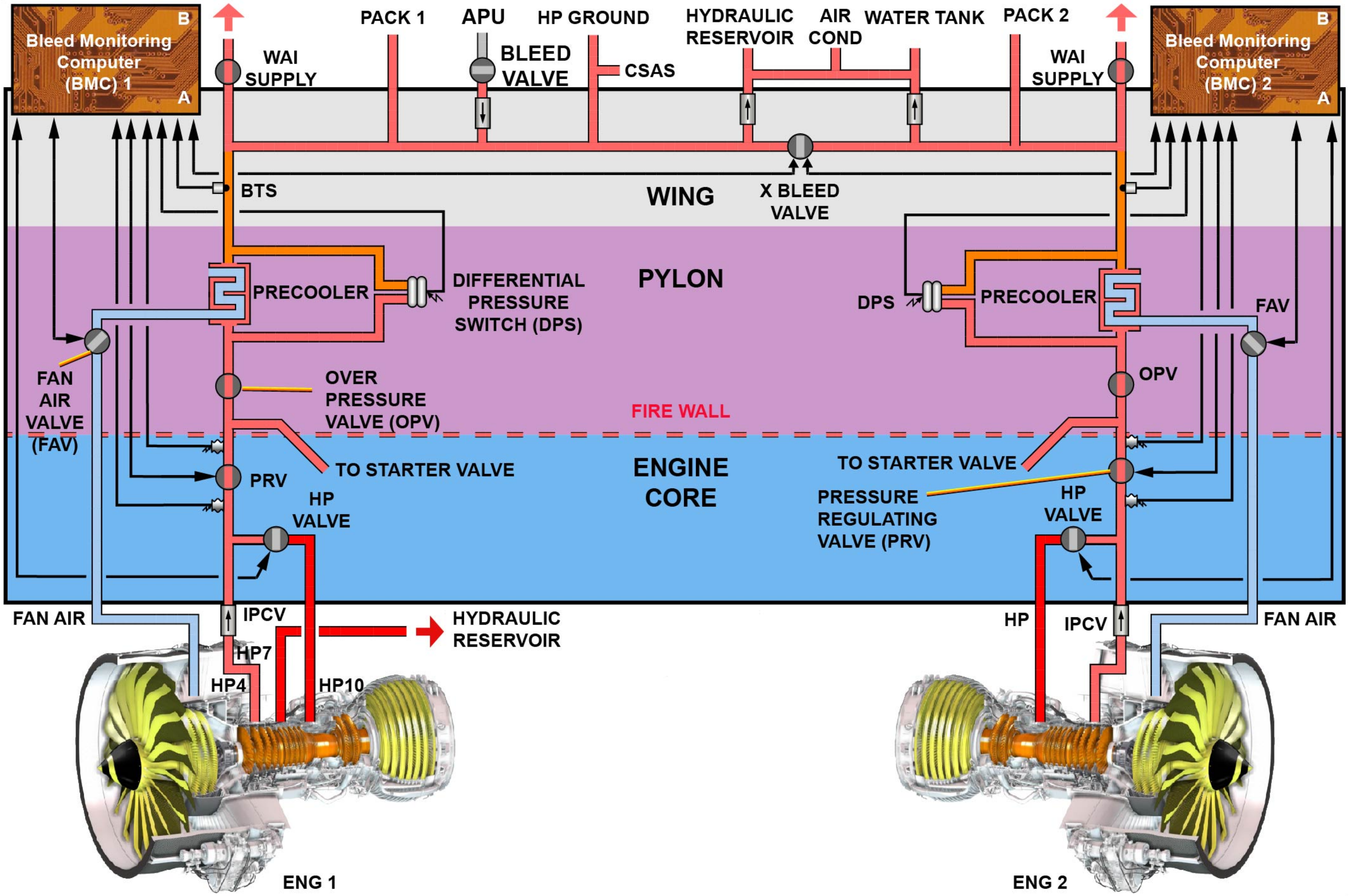
The Pneumatic system is used to supply High Pressure (HP) air for air conditioning, pressurization, Fuel Tank Inerting System (FTIS), engine start and anti-icing. HP air can be supplied from the two engines, the APU or an external ground source.

ENGINE BLEED

The engine bleed air is pressure regulated and temperature controlled before it supplies the aircraft pneumatic system.
Air is bled from the engine High Pressure Compressor (HPC) stages: HP4 via an Intermediate Pressure Check Valve (IPCV) and HP10 via the HP Valve (HPV).
The High Pressure Bleed Valve (HPV) supplies air to the system when the engine is at low power. When the Intermediate Pressure (IP) bleed is sufficient, the HPV closes.
The bleed valves are electro-pneumatically controlled.
The Pressure Regulating Valve (PRV) installed downstream the IPCV and HPV regulates the bleed pressure.
Each Bleed Monitoring Computer (BMC) controls and monitors its engine bleed system and the opposite.
An Overpressure Valve (OPV) is installed downstream from the bleed valve as a protection of the system if the pressure is too high.
The engine bleed air is temperature regulated. The hot bleed air goes through an air-to-air heat exchanger called Precooler. Fan discharge air, modulated by the Fan Air Valve (FAV), is blown across the precooler to keep the temperature within limits.

APU BLEED/EXTERNAL AIR

The left and right bleed systems are connected by a crossbleed duct. A Crossbleed valve is used for their interconnection or isolation.
The APU can also be used for bleed air supply. This is usually done on the ground for air conditioning and for engine start.
But APU BLEED air can also be used in flight, in relation to the altitude. The altitude can be different for each aircraft. These altitude limits are given by the manufacturer. The APU bleed supply is connected to the left side of the crossbleed duct.
On the ground, a HP ground power unit can be connected to the left side pneumatic system. The right side can be supplied by opening the crossbleed valve.


Bleed Monitoring Computer (BMC) 1
B
A
WAI SUPPLY
PACK 1
APU
BLEED VALVE
HP GROUND
CSAS
HYDRAULIC RESERVOIR
AIR COND
WATER TANK
PACK 2
WAI SUPPLY
Bleed Monitoring Computer (BMC) 2
B
A
BTS
WING
X BLEED VALVE
PRECOOLER
DIFFERENTIAL PRESSURE SWITCH (DPS)
PYLON
DPS
PRECOOLER
FAV
FAN AIR VALVE (FAV)
OVER PRESSURE VALVE (OPV)
OPV
FIRE WALL
PRV
TO STARTER VALVE
ENGINE CORE
TO STARTER VALVE
PRESSURE REGULATING VALVE (PRV)
HP VALVE
HP VALVE
FAN AIR
IPCV
HP7
HP4
HP10
HYDRAULIC RESERVOIR
HP
IPCV
FAN AIR
ENG 1
ENG 2

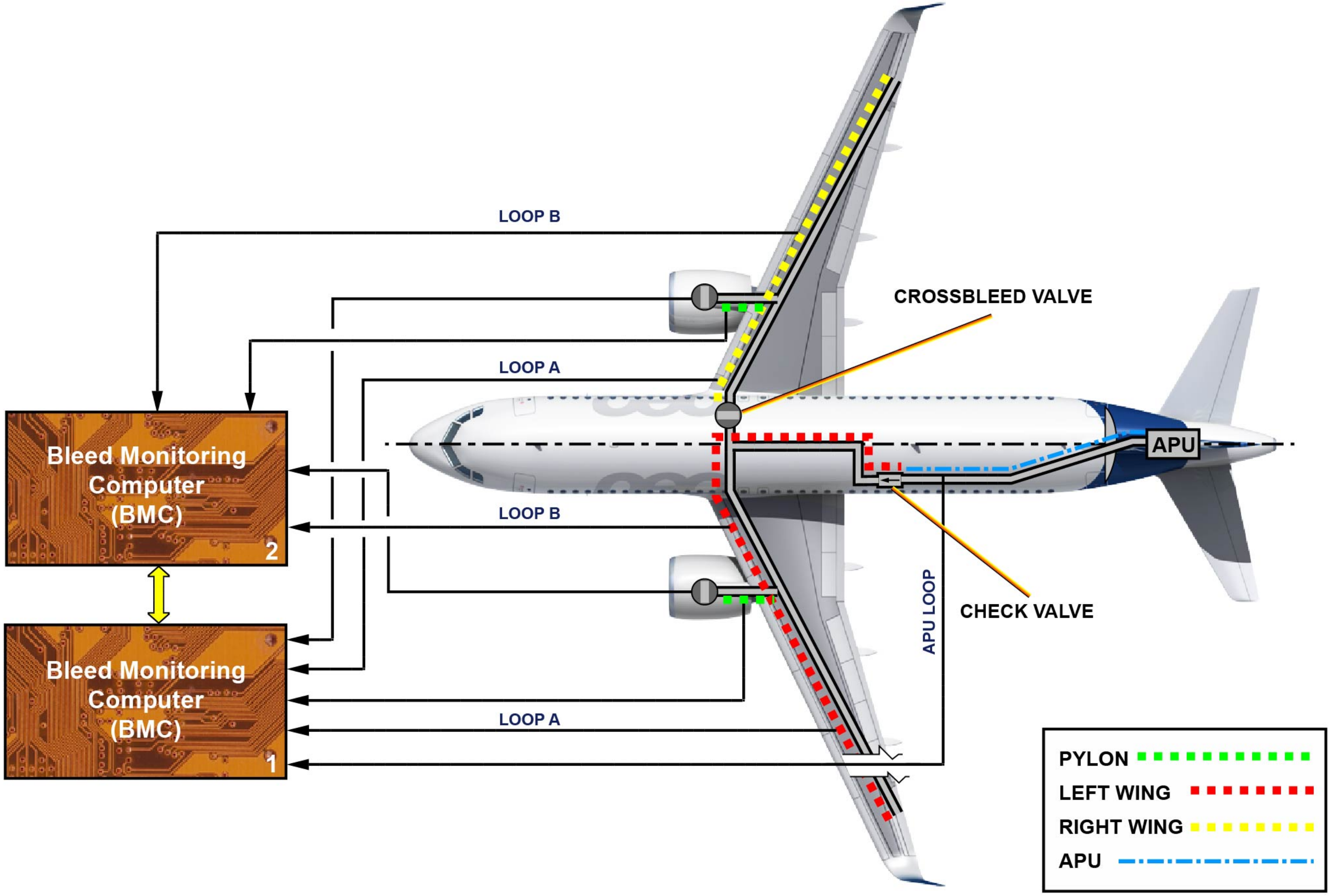
SYSTEM OVERVIEW - ENGINE BLEED & APU BLEED/EXTERNAL AIR

PNEUMATIC SYSTEM COMPONENT LOCATION

SYSTEM OVERVIEW (continued)

LEAK DETECTION

Leak detection loops are installed along the hot air supply ducts of the pneumatic system and are connected to the BMCs. The leak detection system is organized into three loops. Here are the loops and the protected areas: - PYLON: the precooler outlet area,
- WING: wing leading edge and belly fairing,
- APU: APU aft supply duct (left hand side of the fuselage) from APU firewall to wheel well area.


LOOP B
LOOP A
LOOP B
LOOP A
CROSSBLEED VALVE
APU
CHECK VALVE
APU LOOP
Bleed Monitoring Computer (BMC) 2
Bleed Monitoring Computer (BMC) 1
PYLON
LEFT WING
RIGHT WING
APU

SYSTEM OVERVIEW - LEAK DETECTION

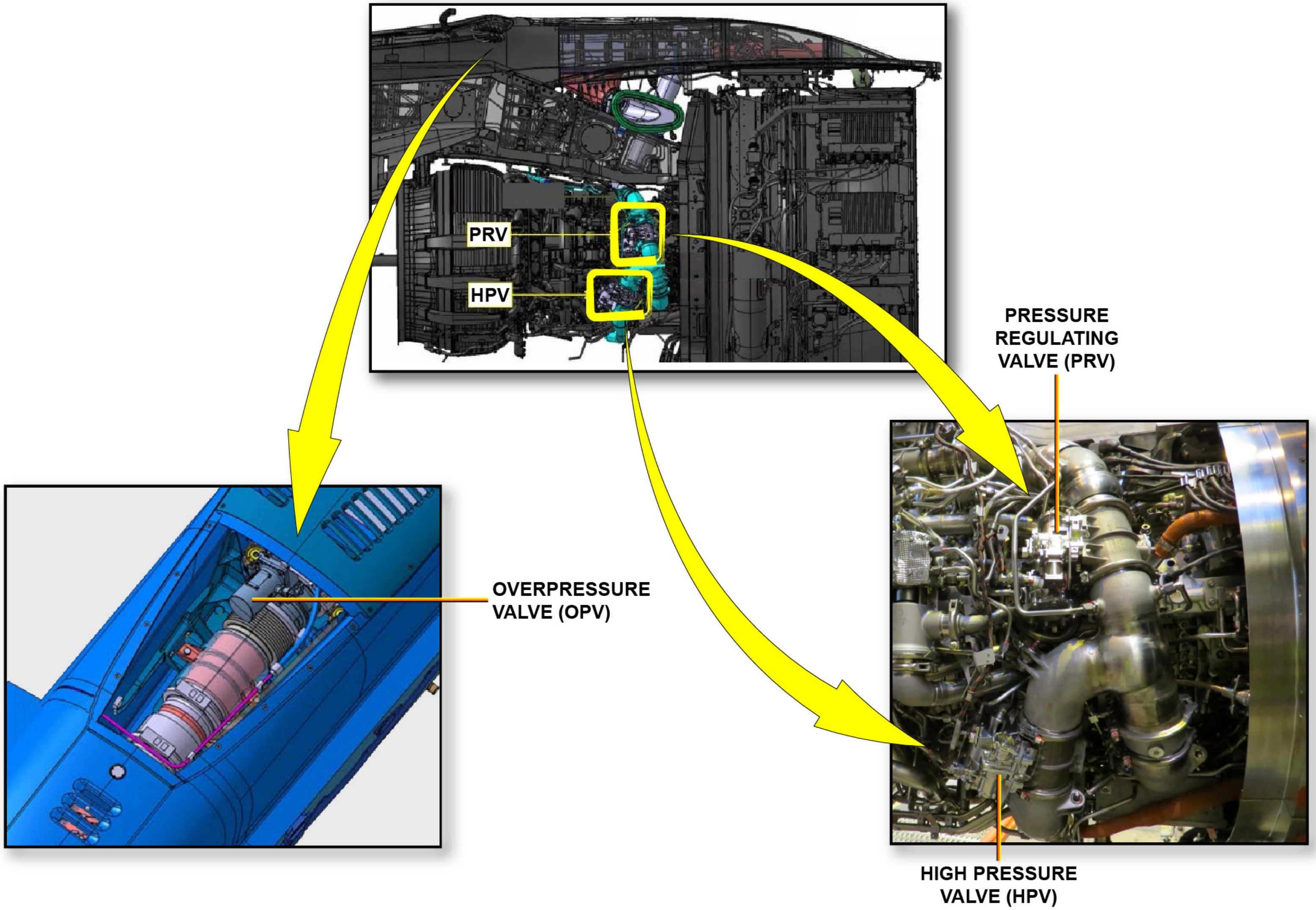
PNEUMATIC SYSTEM COMPONENT LOCATION

COMPONENT LOCATION

The primary components of the pneumatic system are installed on the engines and in the pylons.

PRESSURE REGULATION COMPONENTS

The pressure regulation components for the Engines Bleed Air system are the:
- Engine HPV,
- Engine PRV, located on the right hand side and in pylon,
- OPV,
- Sensors:
- Bleed Monitoring Pressure Sensor (BMPS),
- Bleed Pressure Sensor (BPS),
- Differential Pressure Sensor (DPS).


PRV
HPV
PRESSURE REGULATING VALVE (PRV)
OVERPRESSURE VALVE (OPV)
HIGH PRESSURE VALVE (HPV)

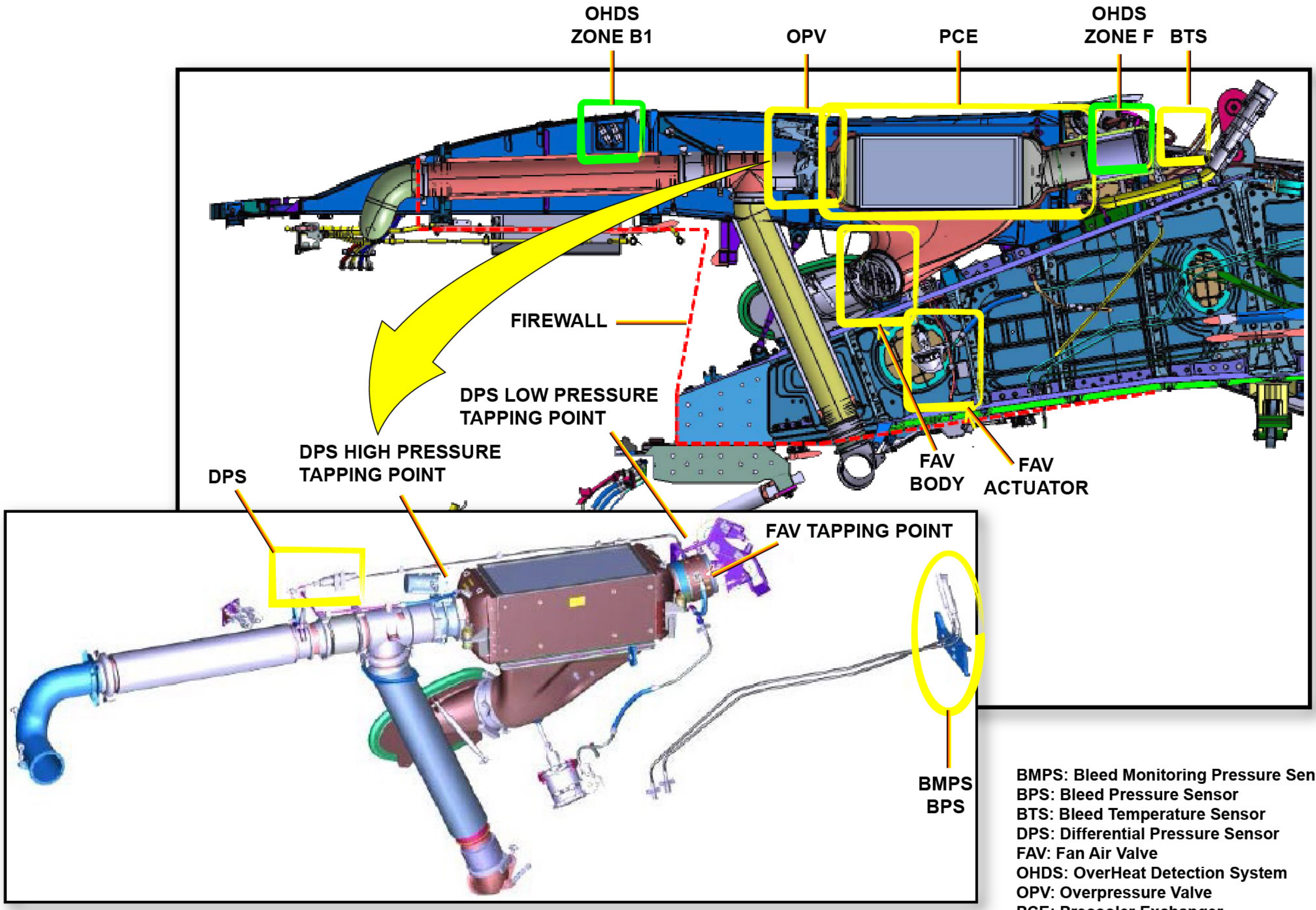
COMPONENT LOCATION - PRESSURE REGULATION COMPONENTS

PNEUMATIC SYSTEM COMPONENT LOCATION

COMPONENT LOCATION (continued)

TEMPERATURE REGULATION COMPONENTS

The temperature regulation components are in the pylons:
- the FAV,
- the Precooler,
- the Bleed Temperature Sensor (BTS).


OHDS
ZONE B1
OPV
PCE
OHDS
ZONE F
BTS
FIREWALL
DPS LOW PRESSURE
TAPPING POINT
DPS HIGH PRESSURE
TAPPING POINT
DPS
FAV
BODY
FAV
ACTUATOR
FAV TAPPING POINT
BMPS
BPS

BMPS: Bleed Monitoring Pressure Sensor
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
DPS: Differential Pressure Sensor
FAV: Fan Air Valve
OHDS: OverHeat Detection System
OPV: Overpressure Valve
PCE: Precooler Exchanger

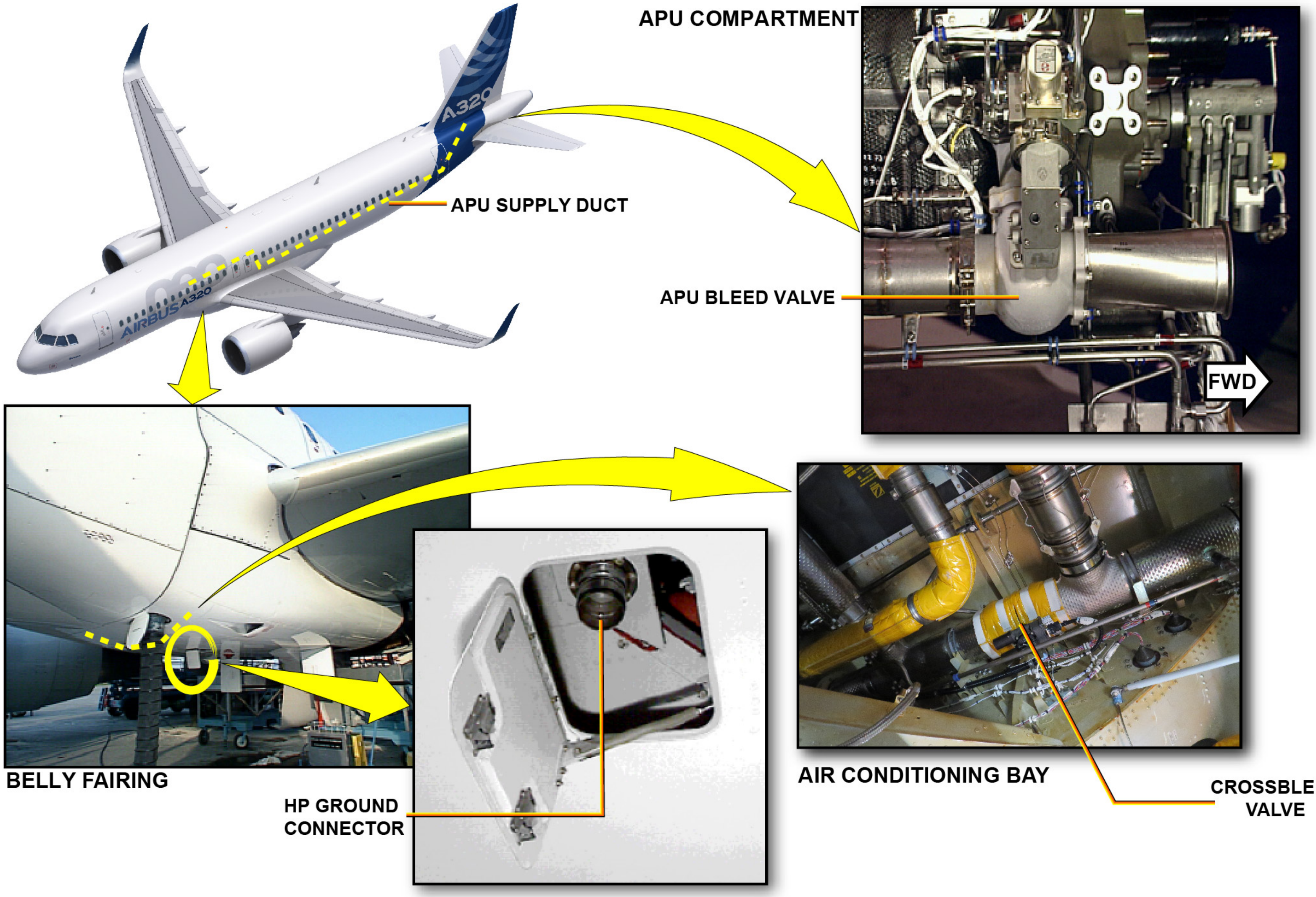
COMPONENT LOCATION - TEMPERATURE REGULATION COMPONENTS

PNEUMATIC SYSTEM COMPONENT LOCATION

COMPONENT LOCATION (continued)

OTHER COMPONENTS

The Crossbleed valve is in the forward section of the lower fuselage belly fairing area.
The access to the HP ground connector is through a small access door on the lower fuselage belly fairing.
The APU bleed valve is on the APU.
The APU supply duct is installed along the left hand side of the fuselage to the wheel well area and is connected to the crossbleed duct in the forward belly fairing area.


APU COMPARTMENT
APU SUPPLY DUCT
APU BLEED VALVE
FWD
BELLY FAIRING
HP GROUND CONNECTOR
AIR CONDITIONING BAY
CROSSBLEED VALVE

COMPONENT LOCATION - OTHER COMPONENTS

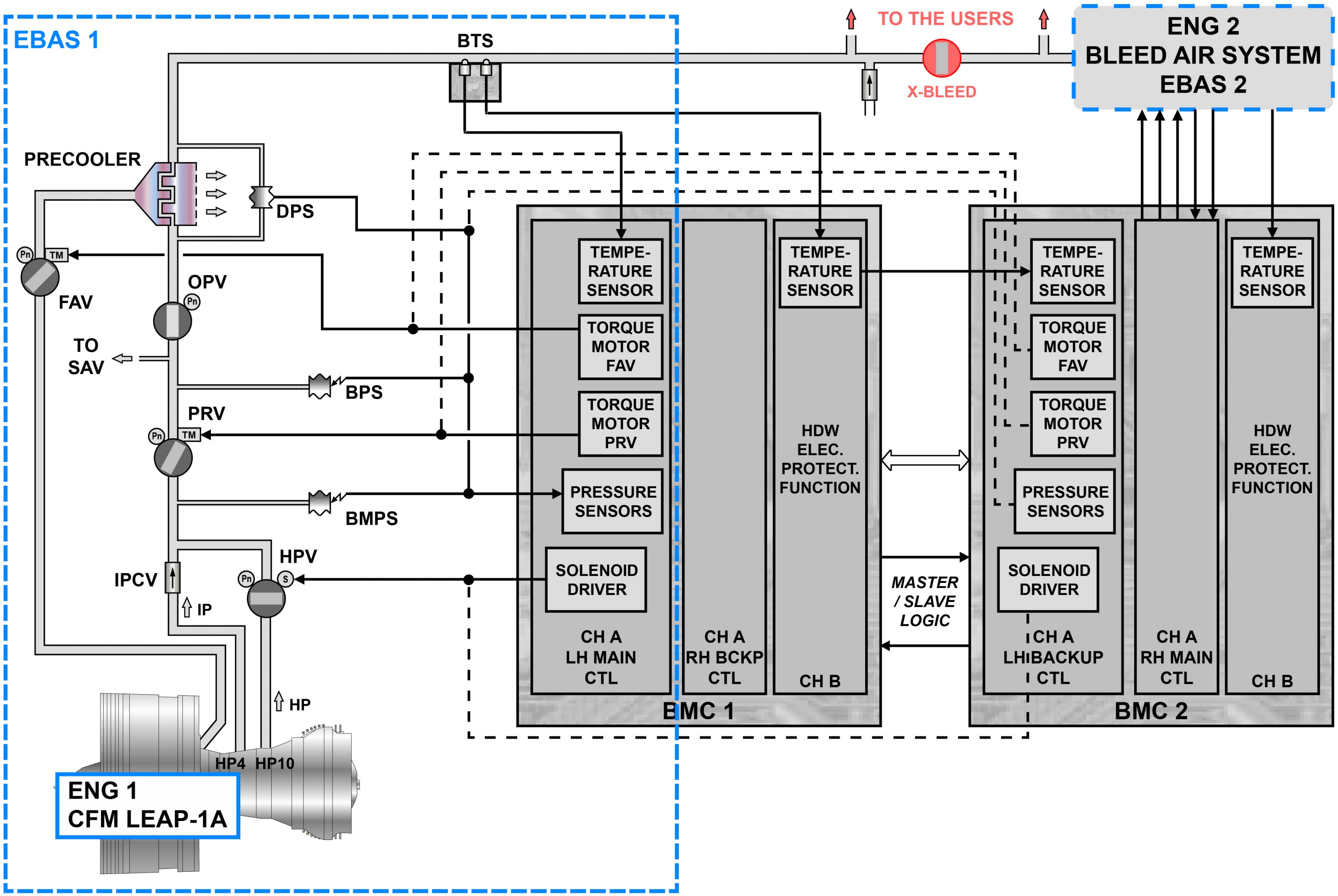
ENGINE BLEED SYSTEM DESCRIPTION

B2 SCOPE

CAUTION: MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

GENERAL

The Engine Bleed Air System (EBAS) supplies pressure and temperature regulated airflow from each engine to the air system users.
During normal operation, each engine bleed system is isolated from adjacent system by the Crossbleed Valve; except during 2nd engine starting using air bled from 1st started engine, Crossbleed Valve opened or under APU Bleed.
The pressure regulation system is controlled and monitored by two Bleed Monitoring Computers (BMCs).
As compared to A320 CEO, the NEO engine has higher bleed air temperatures during High Pressure (HP) operation, lower air pressure during Intermediate Pressure (IP) operation, lower fan pressures for cooling air flow supply and limited space for installation due to new pylon configuration.
To achieve better performance requirements a new electro-pneumatic bleed air system is designed for A320 NEO.

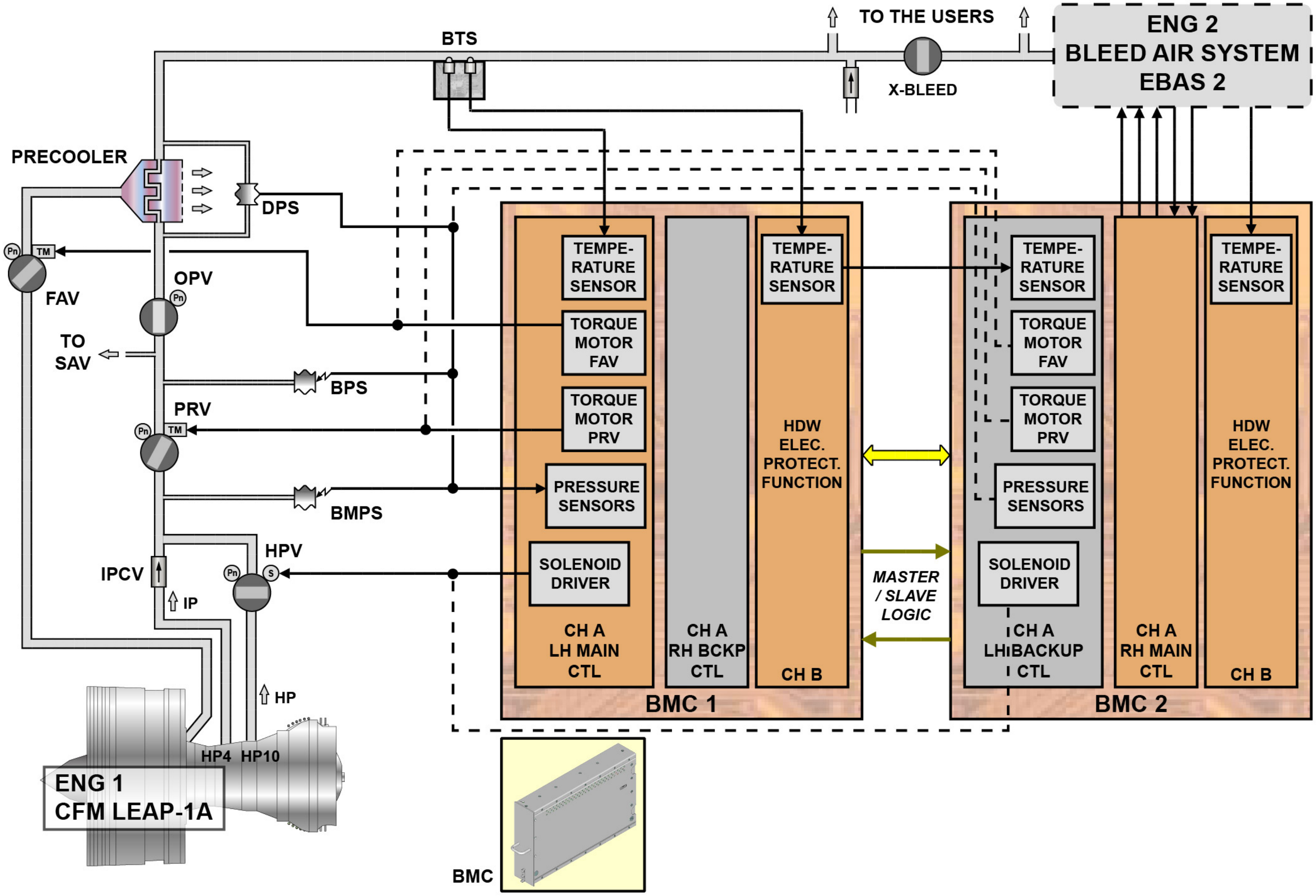

EBAS 1
BTS
TO THE USERS
X-BLEED
ENG 2
BLEED AIR SYSTEM
EBAS 2
PRECOOLER
DPS
FAV
TM
Pn
OPV
TO SAV
BPS
PRV
BMPS
IPCV
IP
HPV
S
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-RATURE SENSOR
TORQUE MOTOR FAV
TORQUE MOTOR PRV
PRESSURE SENSORS
SOLENOID DRIVER
CH A LH MAIN CTL
CH A RH BCKP CTL
HDW ELEC. PROTECT. FUNCTION
CH B
BMC 1
MASTER / SLAVE LOGIC
CH A LH BACKUP CTL
CH A RH MAIN CTL
BMC 2

B2 SCOPE & GENERAL

ENGINE BLEED SYSTEM DESCRIPTION

BMC

Normally BMC 1 Channel A does all the control and monitoring of the LH EBAS and BMC 2 Channel A the RH EBAS.
Each BMC channel A controls torque-motor and solenoid for the electro-pneumatic valves, monitors sensors. As both BMC interface, each one is capable to control both sides.
The channel B is a fully hardware part able to detect the system overtemperature: Electrical Protection Function (EPS). This detection is fully independent from software part.
Each BMC reports the failures independently of each other.


TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
Pn
TM
FAV
OPV
Pn
TO
SAV
BPS
PRV
Pn
TM
BMPS
IPCV
IP
HPV
Pn
S
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 2
BMC

BMC

ENGINE BLEED SYSTEM DESCRIPTION

HPC

HP VALVE (HPV)

The engine air bleed pressure is pneumatically regulated by the HP Valve (HPV) when air is supplied by the High Pressure Compressor (HPC) stage or directly by the Pressure Regulating Valve (PRV) when the air is supplied by the Intermediate Pressure (IP) HPC stage.

− Intermediate-pressure service port: IP is defined by HP4.
− High-pressure service port: HP is defined by HP10.

The HPV lets air to be bled from the engine HP stage at lower power settings. It is a pressure regulating and shut-off valve with a butterfly closure element. It regulates the pressure of the bleed air between 18 and 65 psig. With the Solenoid energized, the minimum upstream muscle pressure needed to operate the valve is 18 psig. When the solenoid is not energized, the HPV is commanded to the full closed position.

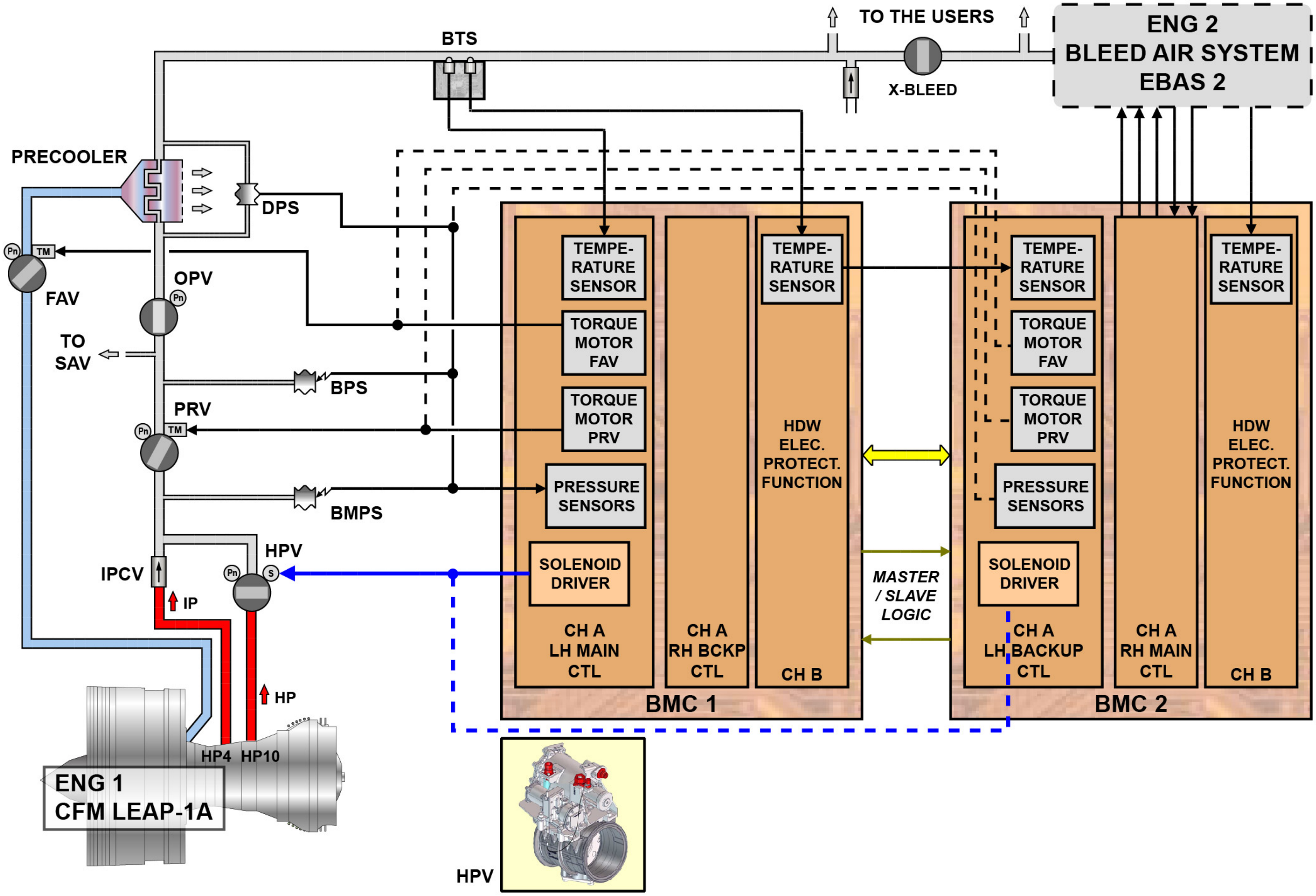
When the solenoid is energized but without pressure in the valve body, the HPV stays closed.

The HPV is forced to close when the PRV is closed. The valve has a manual override and test port for pneumatic test in-situ.

NOTE: To avoid unnecessary switching HP/IP in flight, BMC closes the HPV if the aircraft altitude > 25000 ft.

IP CHECK VALVE (IPCV)

An Intermediate Pressure Check Valve (IPCV) lets air to be bled from the engine IP stage. It is closed when air is bled from HP stage. The purpose of this IPCV is to allow the flow from IP stage and avoid the reverse flow from either the HP port or the pneumatic manifold.


TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
Pn
TM
FAV
OPV
Pn
TO
SAV
BPS
PRV
Pn
TM
BMPS
IPCV
IP
HPV
Pn
S
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 2
HPV

HPC - HP VALVE (HPV) & IP CHECK VALVE (IPCV)

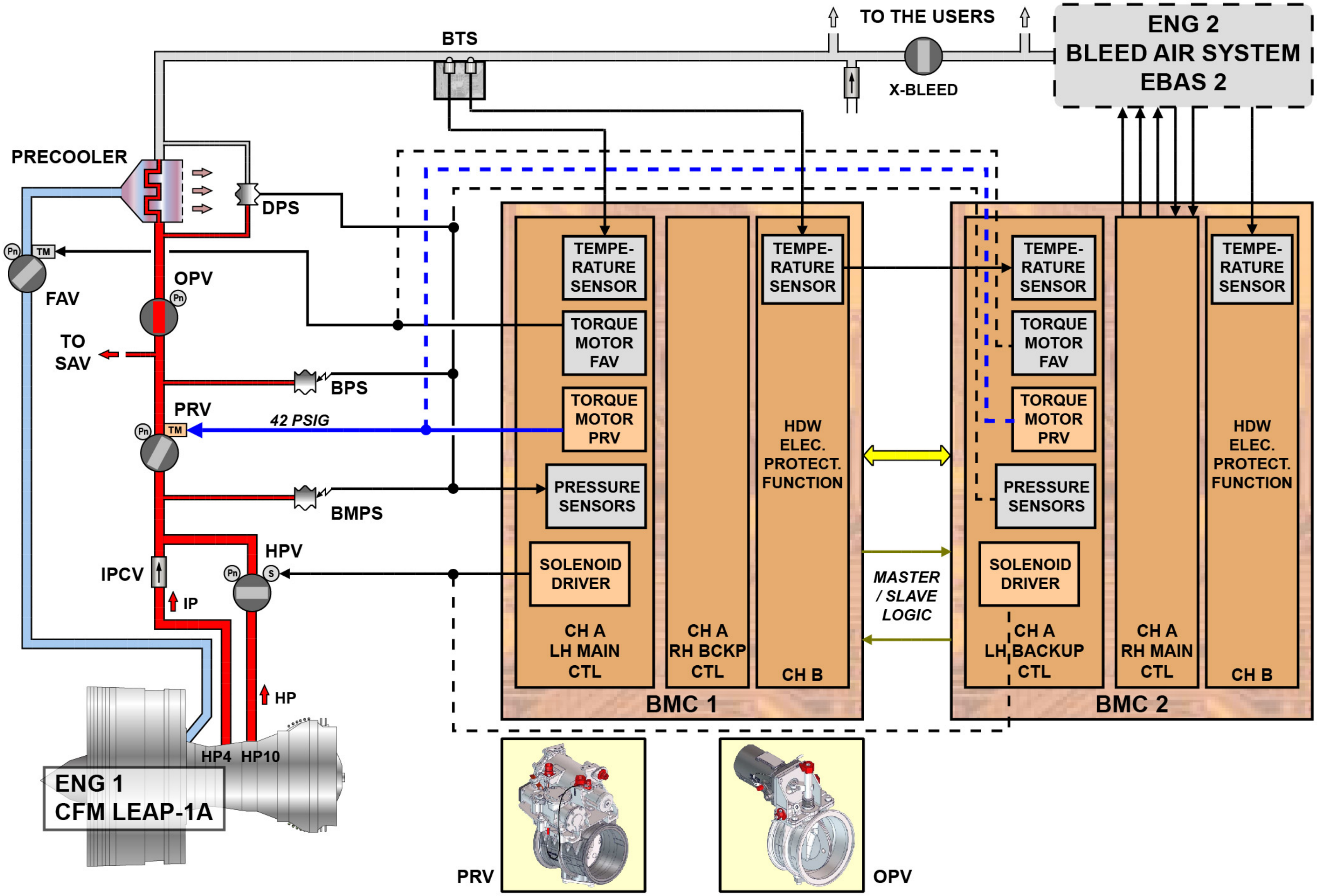
ENGINE BLEED SYSTEM DESCRIPTION

PRESSURE REGULATING VALVE (PRV)

The PRV is a 4 inch diameter butterfly valve, installed downstream of the IPCV and HPV.
It regulates the pressure of the bleed air at 42 ± 2 psig in normal dual bleed operation (50 ± 2 psig in single bleed operation).
Its setting is modulated by the electric command on the torque-motor.
When the torque-motor is de-energized, the PRV is commanded to the full closed position.
When the torque-motor is energized but without pressure, the PRV stays closed.
With the torque-motor energized, the minimum upstream muscle pressure needed to operate the valve is 15 psig.
The PRV operates as a shut off valve when abnormal conditions occur.
In case of electrical failure of the EBAS, pressure control is ensured by the PRV in back-up pneumatic control mode.
The valve has a manual override and test port for pneumatic test in-situ.

OVERPRESSURE VALVE (OPV)

The Overpressure Valve (OPV) located in the pylon and downstream of the PRV, protects the system against damage if overpressure occurs.
It operates pneumatically. The OPV, normally in spring-loaded open position will start to close at 75 psig and is fully closed at 90 psig.
The OPV is fitted with a manual override and locking device which enables to lock the valve in the open position when it fails closed in order to start the engine.


TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
FAV
OPV
TO
SAV
BPS
PRV
42 PSIG
BMPS
IPCV
IP
HPV
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 2
PRV
OPV
Pn
TM
S

PRESSURE REGULATING VALVE (PRV) - OVERPRESSURE VALVE (OPV)

ENGINE BLEED SYSTEM DESCRIPTION

PRESSURE SENSORS

BLEED MONITORING PRESSURE SENSOR (BMPS)

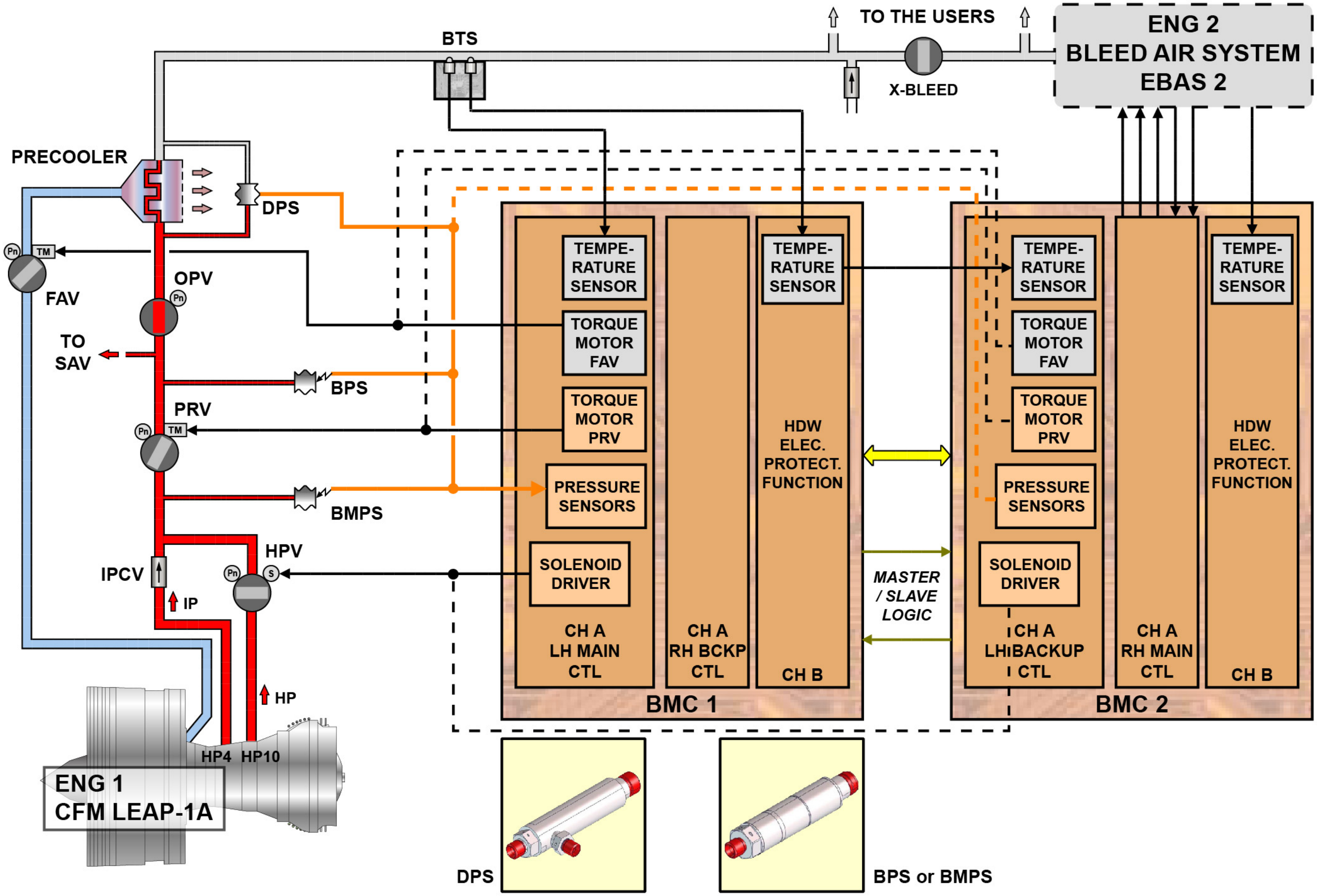
The Bleed Monitoring Pressure Sensor (BMPS) is used to perform bleed port switching function. It is also used to estimate the position of the HPV butterfly and to monitor the HPV and the PRV.

BLEED PRESSURE SENSOR (BPS)

The Bleed Pressure Sensor (BPS) is installed downstream the PRV. It provides to BMC the actual bleed air pressure delivered through the PRV. This sensor is also used by the BMC for system monitoring (overpressure and low pressure alarms) and to monitor the position of the OPV butterfly.

DIFFERENTIAL PRESSURE SENSOR (DPS)

The Differential Pressure Sensor (DPS) ensures the reverse flow protection by sensing the differential pressure between Precooler hot side inlet and outlet. It also provides to the BMC an indication of the PRV and OPV position.


TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
Pn
TM
FAV
OPV
TO
SAV
BPS
PRV
BMPS
IPCV
IP
HPV
S
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
BMC 2
DPS
BPS or BMPS

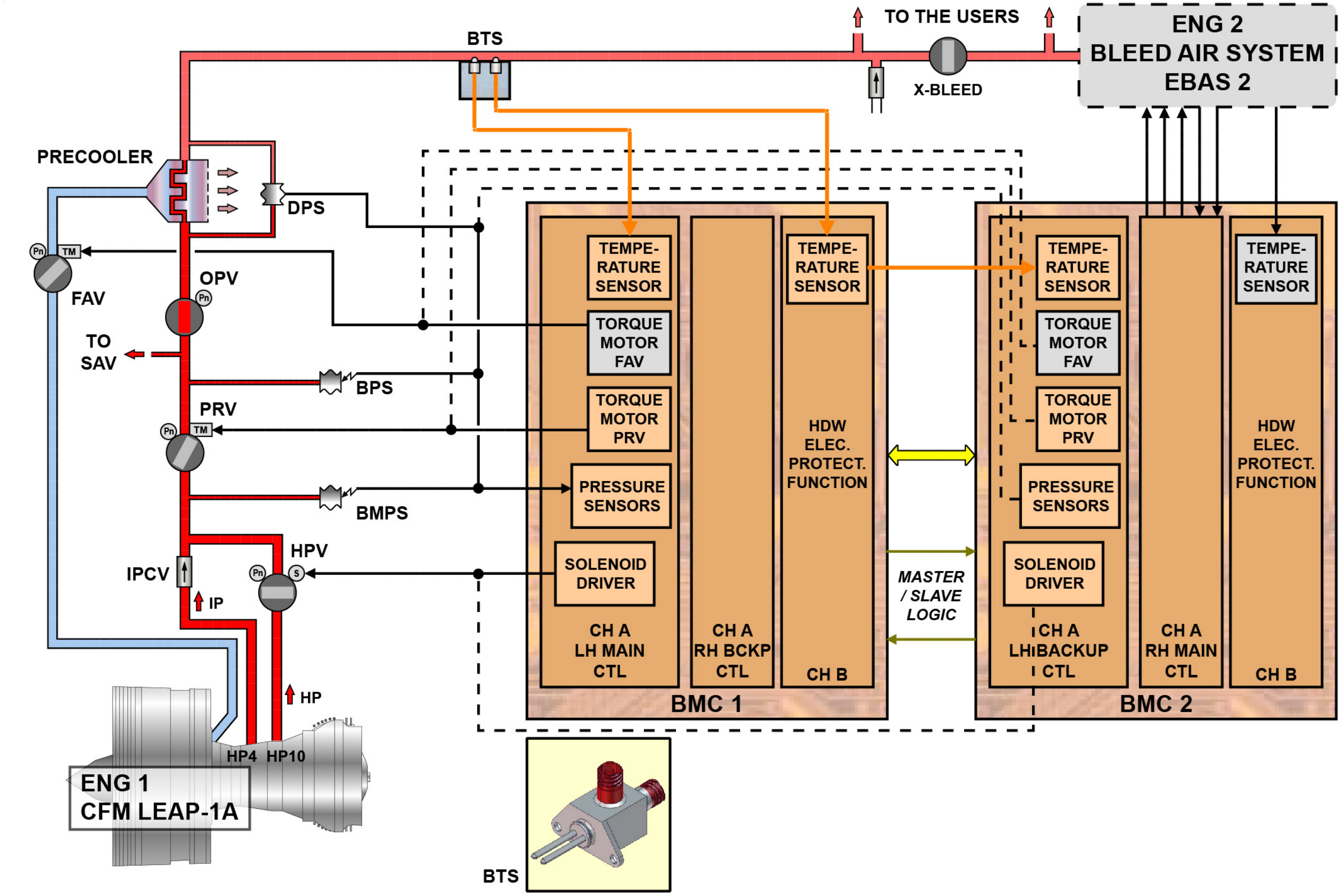
PRESSURE SENSORS - BLEED MONITORING PRESSURE SENSOR (BMPS) ... DIFFERENTIAL PRESSURE SENSOR (DPS)

ENGINE BLEED SYSTEM DESCRIPTION

BLEED TEMPERATURE SENSOR (BTS)

The dual Bleed Temperature Sensor (BTS) installed downstream the Precooler provides to the BMC the actual EBAS temperature.
The BMC uses EBAS temperature to position the Fan Air Valve (FAV).
The wiring connected to channel A of the BTS is fully segregated from the wiring connected to channel B.
Both BMCs interchange temperature measurements and can carry out both sides temperature regulation.
This dual sensor is also used by the BMCs for system monitoring (overtemperature and low temperature alarms).

NOTE: Channel B of one BMC is connected to Channel A of the other BMC, so that in case of loss of temperature monitoring and control in Channel A of one side, the opposite controller can take over control of the whole EBAS.


TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
FAV
OPV
TO
SAV
BPS
PRV
BMPS
HPV
IPCV
IP
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 2
Pn
TM
S
BTS

BLEED TEMPERATURE SENSOR (BTS)

ENGINE BLEED SYSTEM DESCRIPTION

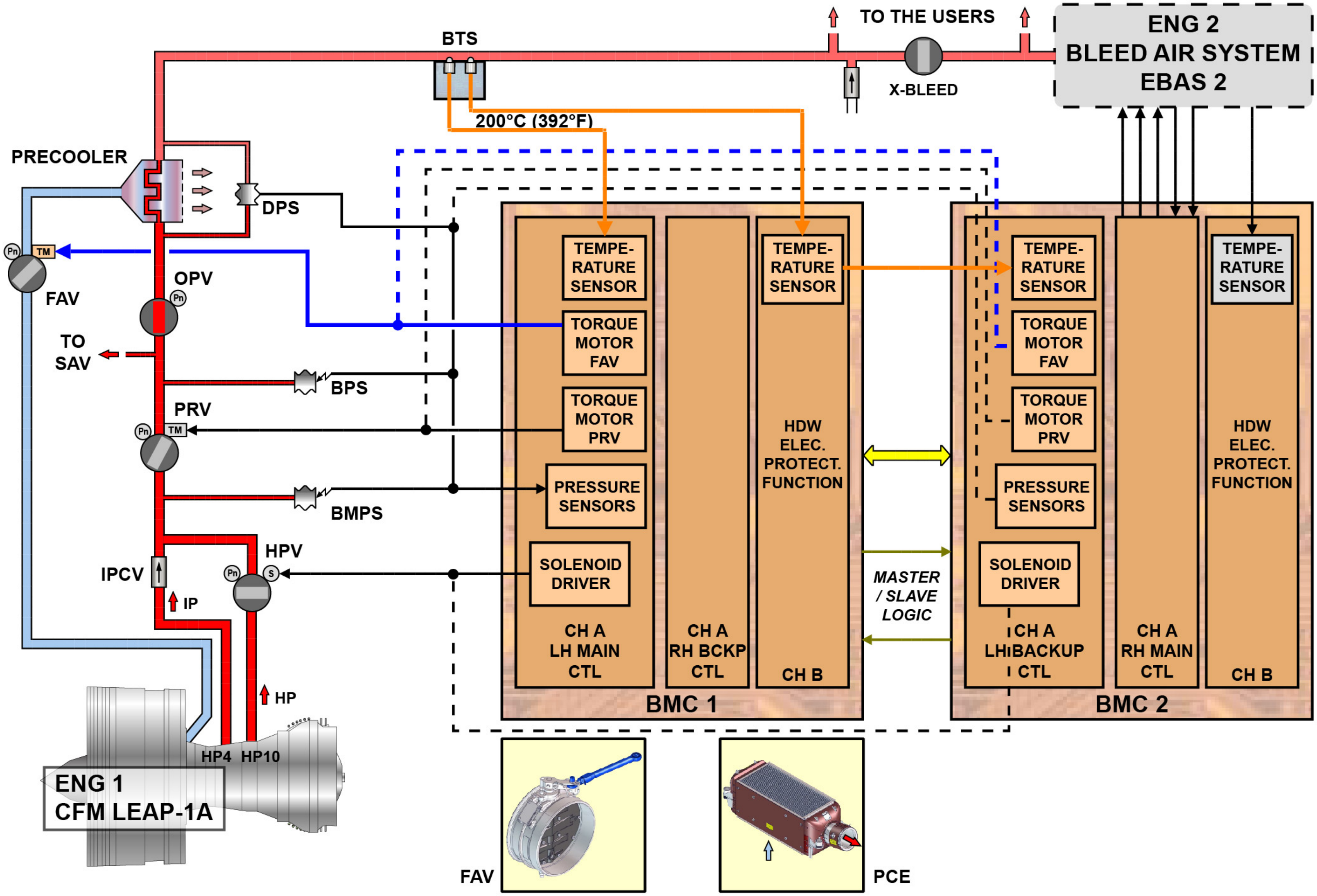
TEMPERATURE REGULATION

FAN AIR VALVE (FAV)

The FAV pneumatically regulates the fan airflow to the Precooler for bleed air temperature regulation.
The FAV butterfly valve actuator rod is adjusted by the BMC via a torque motor servo-control depending on BTS input.
The BMC set point is 200°C (392°F) in normal operations and 160°C (320°F) in Climb and Hold with 2 bleeds and Wing Anti-Ice (WAI) off.
With no electrical power and enough muscle pressure, the FAV valve is fully open.
The valve has a test port for pneumatic test in-situ.

PRECOOLER EXCHANGER

The Precooler (PCE) is a stainless steel and nickel alloy air-to-air heat exchanger.
It cools down the hot air supplied from the engine HP compressor stage by a heat exchange process with cooling flow taken from the engine fan.

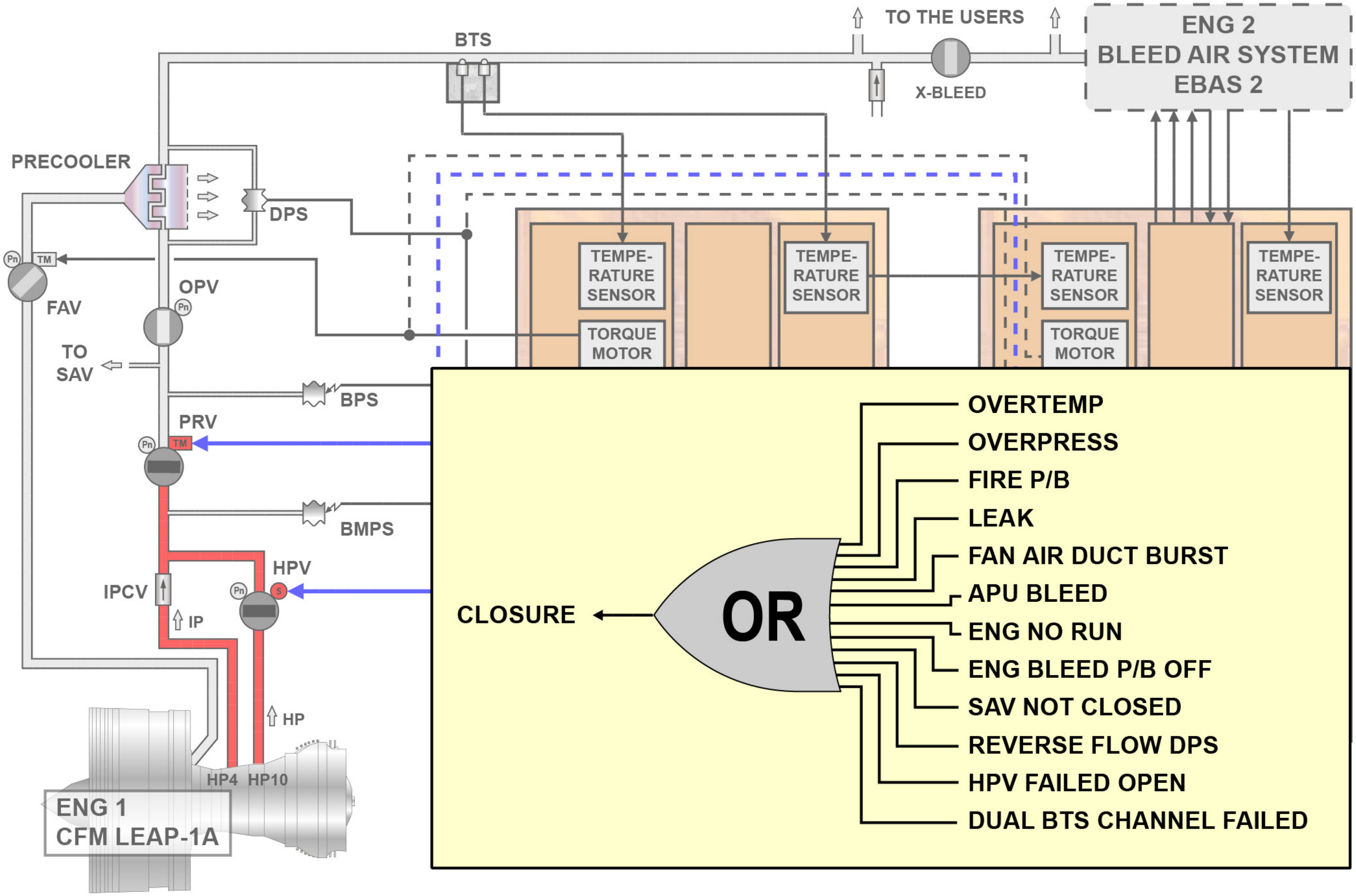

TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
200°C (392°F)
PRECOOLER
DPS
FAV
OPV
TO SAV
BPS
PRV
BMPS
IPCV
IP
HPV
HP
HP4
HP10
ENG 1
CFM LEAP-1A
TEMPE-RATURE SENSOR
TORQUE MOTOR FAV
TORQUE MOTOR PRV
PRESSURE SENSORS
SOLENOID DRIVER
CH A LH MAIN CTL
CH A RH BCKP CTL
HDW ELEC. PROTECT. FUNCTION
CH B
BMC 1
MASTER / SLAVE LOGIC
CH A LH BACKUP CTL
CH A RH MAIN CTL
BMC 2
FAV
PCE

TEMPERATURE REGULATION - FAN AIR VALVE (FAV) & PRECOOLER EXCHANGER

ENGINE BLEED SYSTEM DESCRIPTION

PROTECTION - ISOLATION

The PRV operates as a shut-off valve. It is commanded to close in the following conditions:
- Over-temperature downstream of the Precooler (BTS):
257°C (495°F) < T   270°C (518°F) during 55s,
270°C (518°F) < T   290°C (554°F) for 15s,
T > 290°C (554°F) for 5s.
- Overpressure downstream of the PRV > 60 ± 3 psig at BPS,
- Engine fire (consequence of crew action on the ENG FIRE P/B),
- Leak detection in pylon/wing/fuselage ducts surrounding areas,
- Engine Fan air duct burst reported through EIU,
- APU bleed valve not closed & APU BLEED P/B selected:
Depending on the Crossfeed Bleed Valve (CBV) position, only one PRV (left engine PRV if CBV is closed) or both (if XBleed is open).
- Reverse flow detected by DPS,
- ENG BLEED P/B selected OFF or ENG not running,
- Associated Starter Air Valve (SAV) not closed,
- HPV failed open,
- Dual BTS channels failed.

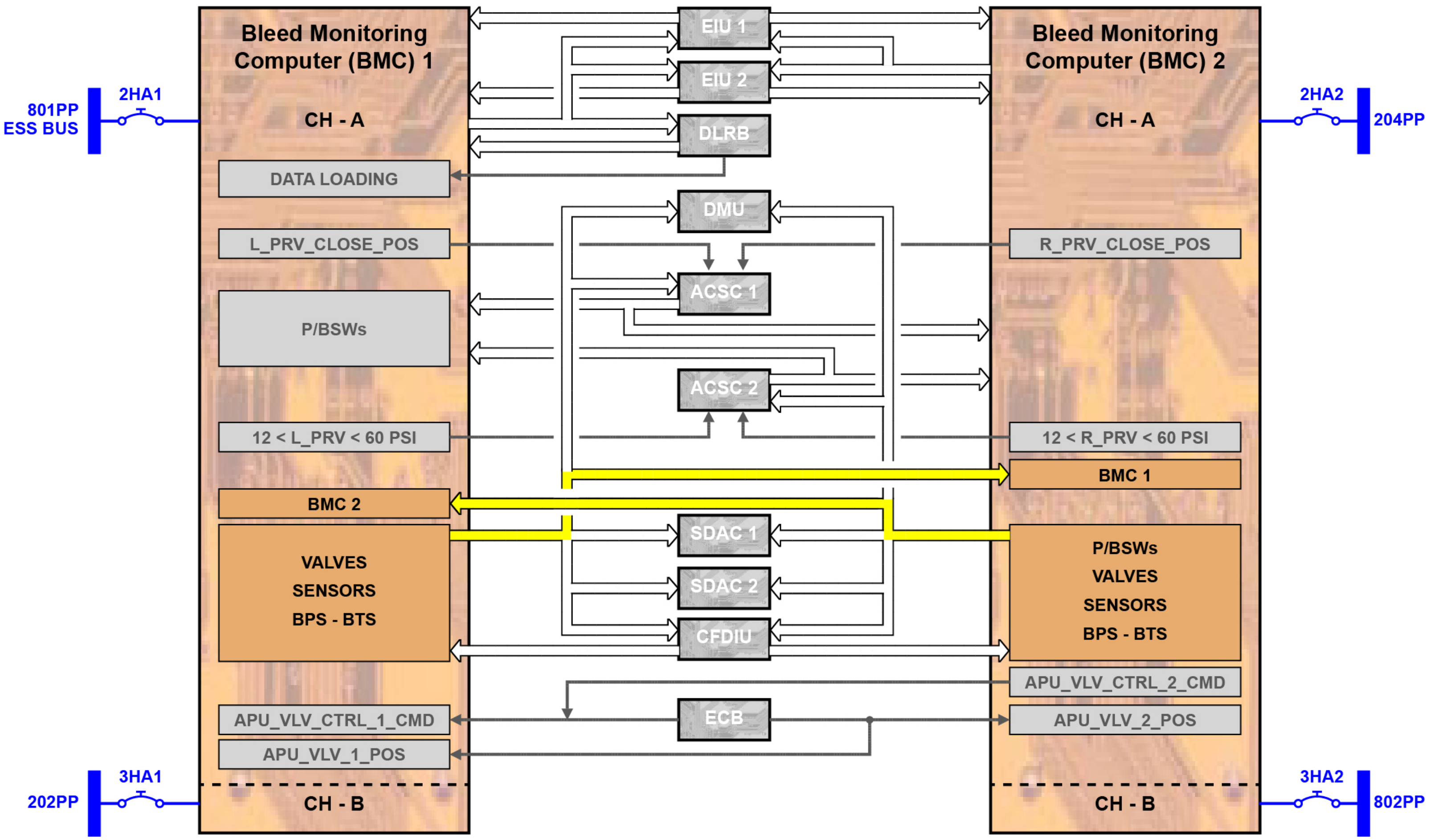

TO THE USERS
ENG 2
BLEED AIR SYSTEM
EBAS 2
BTS
X-BLEED
PRECOOLER
DPS
TEMPE-RATURE SENSOR
TEMPE-RATURE SENSOR
TEMPE-RATURE SENSOR
TEMPE-RATURE SENSOR
TORQUE MOTOR
TORQUE MOTOR
Pn
TM
FAV
OPV
TO SAV
BPS
PRV
BMPS
HPV
IPCV
IP
HP
HP4
HP10
ENG 1
CFM LEAP-1A
OVERTEMP
OVERPRESS
FIRE P/B
LEAK
FAN AIR DUCT BURST
APU BLEED
ENG NO RUN
ENG BLEED P/B OFF
SAV NOT CLOSED
REVERSE FLOW DPS
HPV FAILED OPEN
DUAL BTS CHANNEL FAILED
OR
CLOSURE

PROTECTION - ISOLATION

BMC INTERFACES (PW1100G)

BMC

The pneumatic system uses 2 identical controllers with a microprocessor and command channel A and a back-up channel B. Each channel is supplied by a different 28V DC bus bar.
Both Bleed Monitoring Computers (BMCs) will work as MASTER/SLAVE so long as the ARINC429 cross communication is working properly.
If one ARINC429 bus is lost from one BMC to the other, the BMC receiving no data will take over control and would inform to the opposite BMC.


Bleed Monitoring Computer (BMC) 1
CH - A
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
CH - B
2HA1
801PP
ESS BUS
3HA1
202PP
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
Bleed Monitoring Computer (BMC) 2
CH - A
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
CH - B
2HA2
204PP
3HA2
802PP

ACSC: Air Conditioning System Controller
APU: Auxiliary Power Unit
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit

CMD: Command
CTRL: Control
DLRB: Data Loading Routing Box
DMU: Data Management Unit
ECB: Electronic Control Box

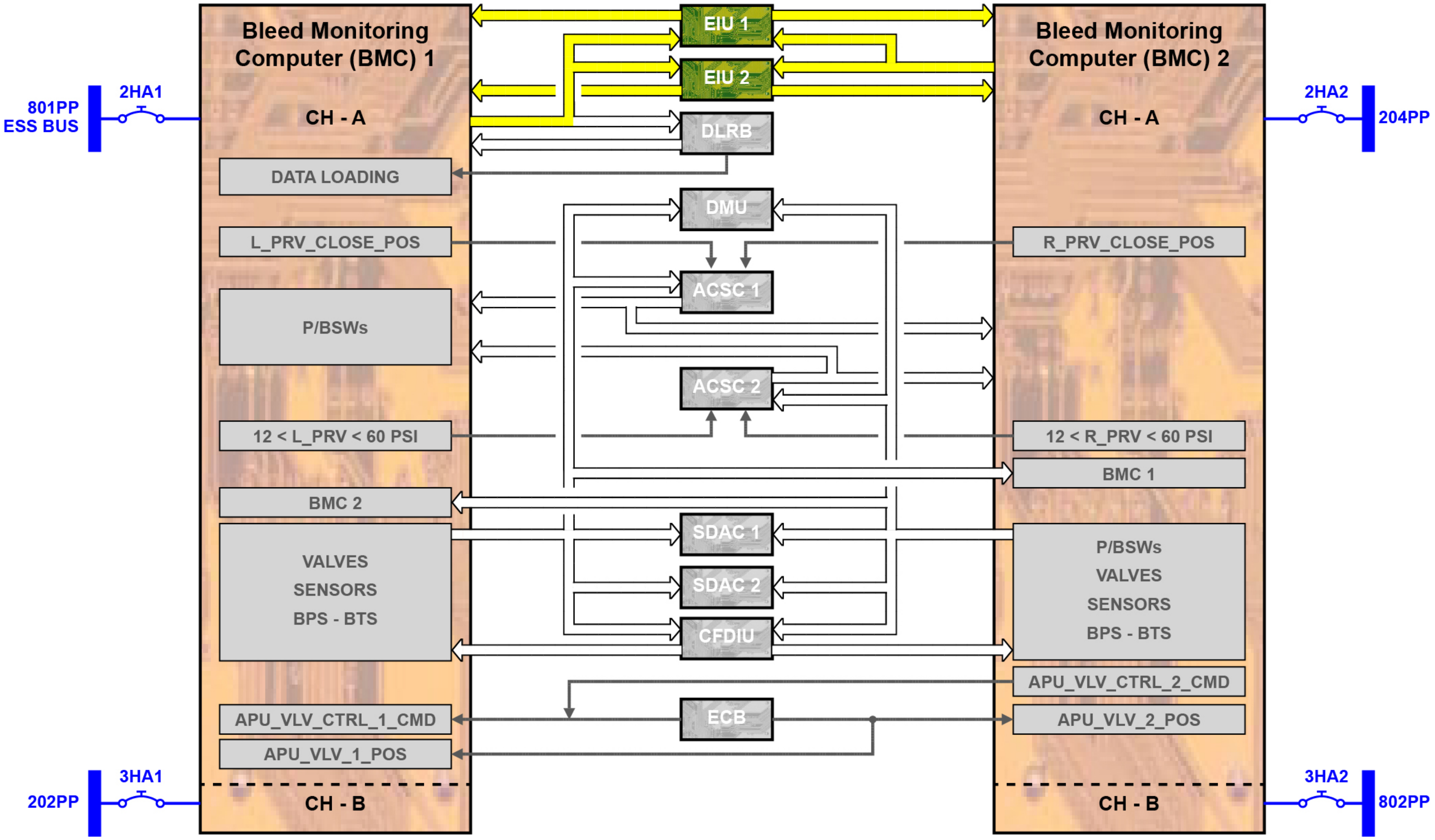
EIU: Engine Interface Unit
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

BMC

BMC INTERFACES (PW1100G)

EIU

The Propulsion Control System (PCS) informs both BMCs via both Engine Interface Units (EIUs) when engines start/run.
The Electronic Engine Control (EEC) will need information relative to the Aircraft Environmental Control System (ECS) from the EIU ARINC data bus as system bleed pressure, bleed and anti-ice configuration.
The EIUs receive positions of ENG BLEED P/Bs ON, APU BLEED P/B OFF, Crossbleed valve status.


Bleed Monitoring Computer (BMC) 1
CH - A
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
CH - B
801PP
ESS BUS
2HA1
202PP
3HA1
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
Bleed Monitoring Computer (BMC) 2
CH - A
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
CH - B
2HA2
204PP
3HA2
802PP

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BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit
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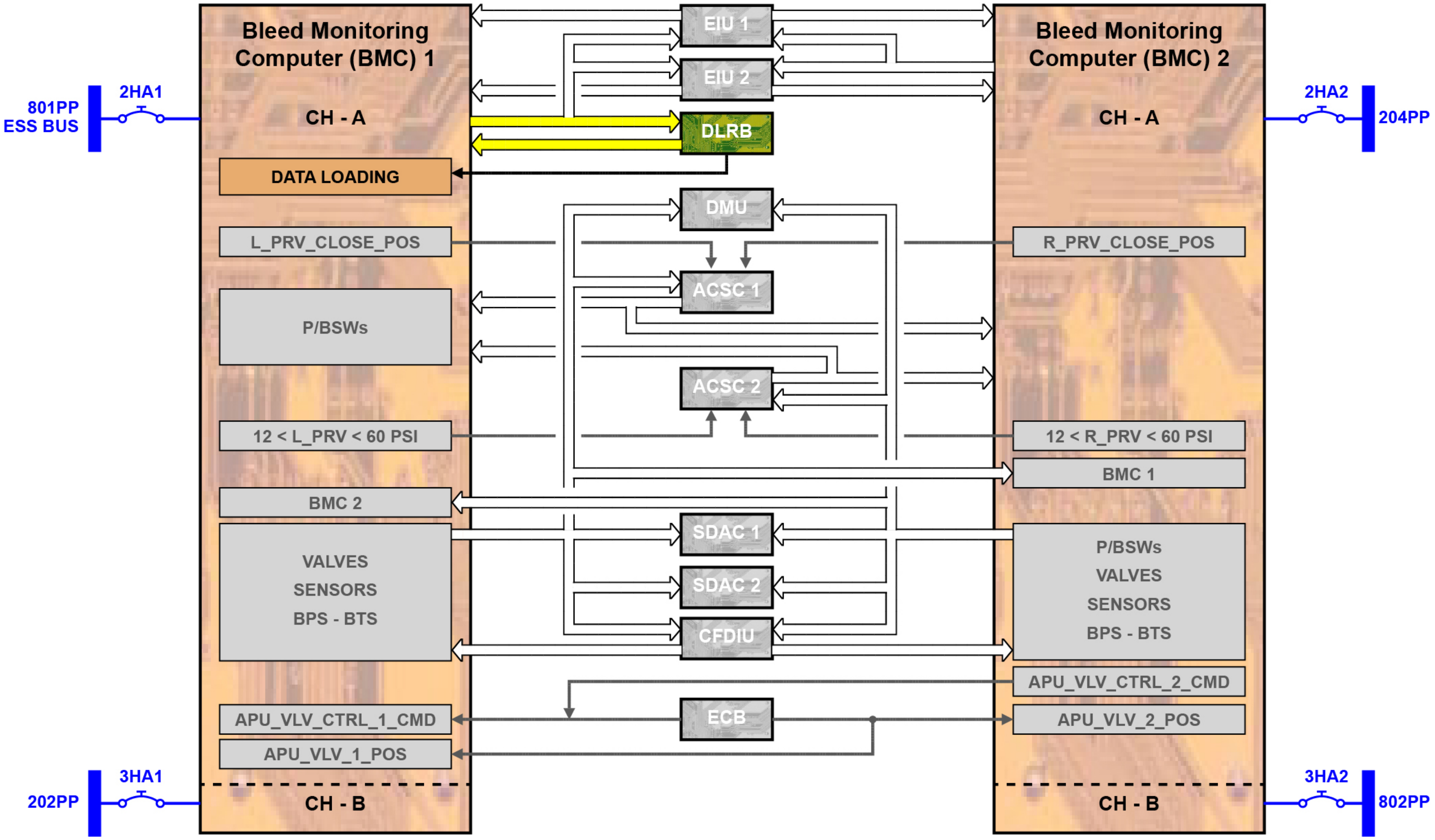
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

EIU

BMC INTERFACES (PW1100G)

DATA LOADING

The up and down data loading system is an interface between the onboard computers as BMCs and the ground-base data processing stations.
For data loading purposes, the BMC 1 Channel A is connected to Data Loading Routing Box (DLRB). The BMC 2 Channel A will be loaded through BMC 1 Channel A. The BMC 2 will be uploaded through the crosstalk bus from the BMC 1 once the BMC 1 has been fully uploaded from the data loader.


Bleed Monitoring Computer (BMC) 1
CH - A
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
CH - B
801PP
ESS BUS
2HA1
202PP
3HA1
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
Bleed Monitoring Computer (BMC) 2
CH - A
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
CH - B
2HA2
204PP
3HA2
802PP

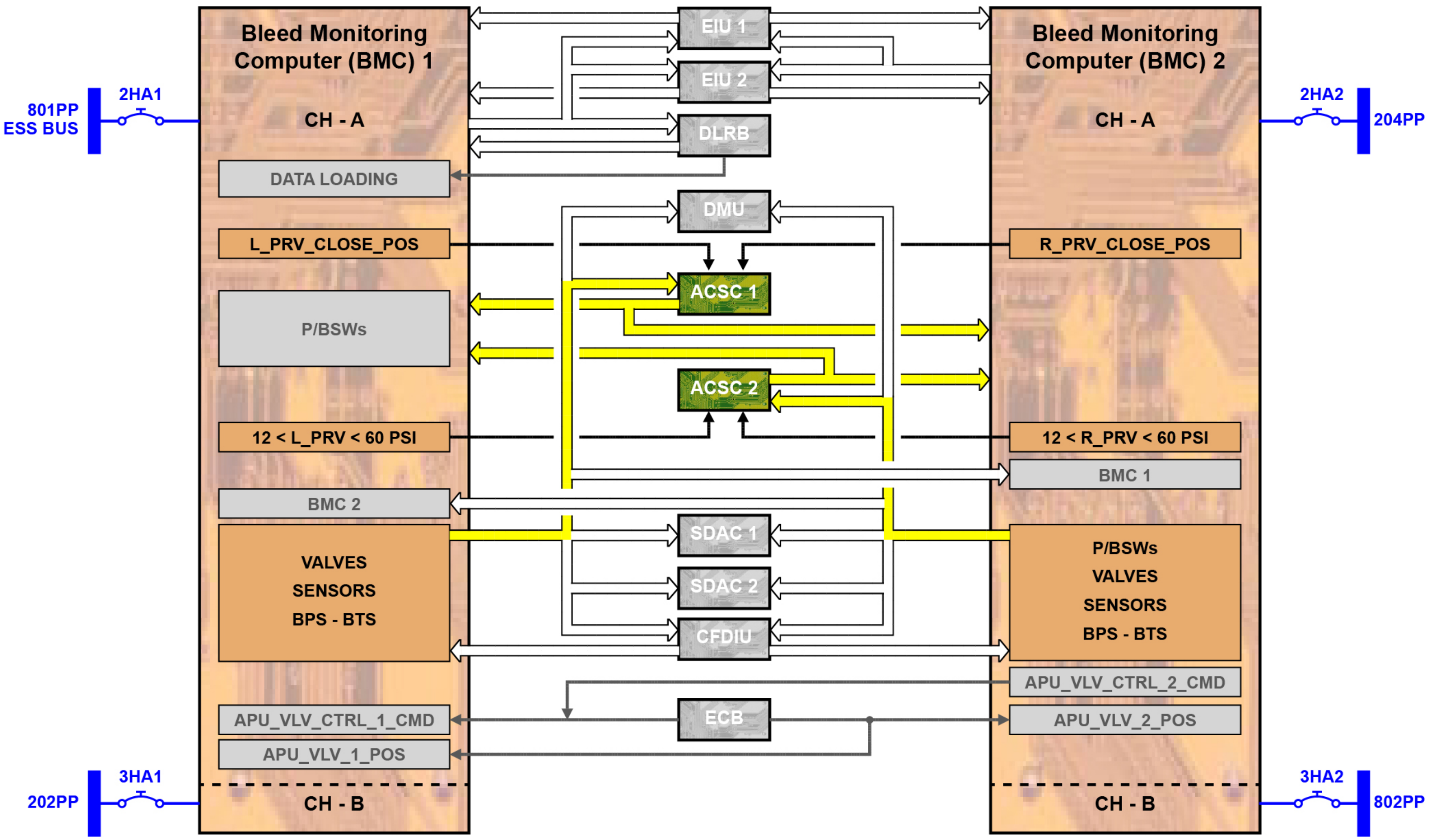
ACSC: Air Conditioning System Controller
APU: Auxiliary Power Unit
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit
CMD: Command
CTRL: Control
DLRB: Data Loading Routing Box
DMU: Data Management Unit
ECB: Electronic Control Box
EIU: Engine Interface Unit
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

DATA LOADING

BMC INTERFACES (PW1100G)

ACSC

The BMC inform the Air Conditioning System Controller (ACSC) on the precooler outlet temperature for pack flow calculation. The bleed pressure Sensor (BPS) and the wired Crossbleed valve position are used for Pack Inlet Pressure Sensor (PIPS) monitoring.
The BMC send a discrete input of its Pressure Regulating Valve (PRV) position.
Another discrete signal informs about the precooler delivered bleed pressure.
The ACSCs input the BMCs for Pack 1/2 P/B SW position, Pack Inlet Pressure and wing anti-ice valves position.


Bleed Monitoring Computer (BMC) 1
CH - A
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
CH - B
801PP
ESS BUS
2HA1
3HA1
202PP
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
Bleed Monitoring Computer (BMC) 2
CH - A
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
CH - B
2HA2
204PP
3HA2
802PP

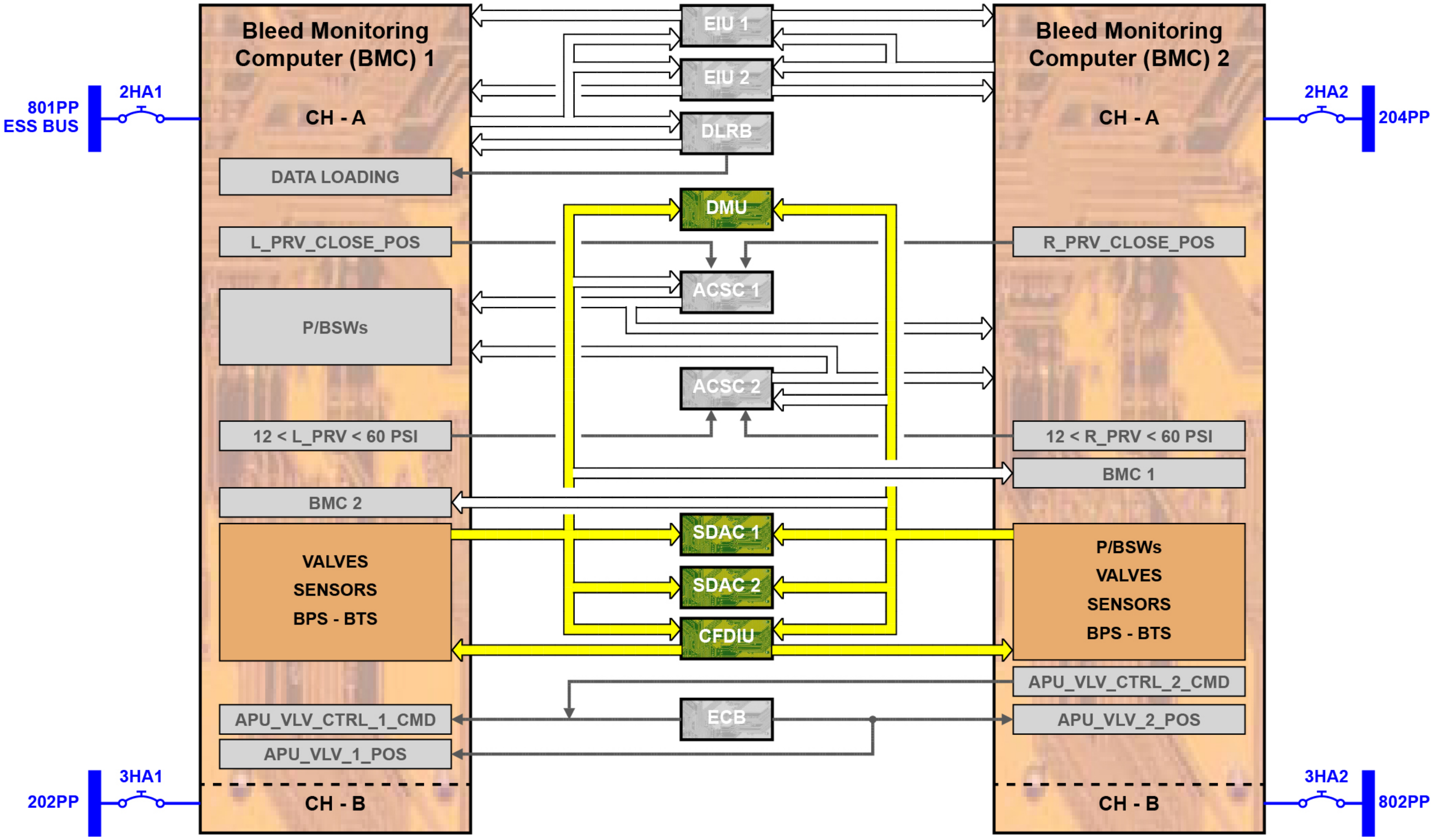
ACSC: Air Conditioning System Controller
APU: Auxiliary Power Unit
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit
CMD: Command
CTRL: Control
DLRB: Data Loading Routing Box
DMU: Data Management Unit
ECB: Electronic Control Box
EIU: Engine Interface Unit
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

ACSC

BMC INTERFACES (PW1100G)

DISPLAY

The BMCs 1 and 2 transmit ARINC signals to the System Data Acquisition Concentrator (SDAC) for monitoring, fault indication, warning and data recording purposes by the Flight Warning Computer (FWC), Electronic Instrument System (EIS) and Digital Flight Data Recording System (DFDRS).
The Centralized Fault Display Interface Unit (CFDIU) is connected to the BITE of the BMCs to centralize the pneumatic system data for maintenance via the Multipurpose Control and Display Units (MCDUs), printer and Aircraft Communication Addressing and Reporting System (ACARS).


Bleed Monitoring Computer (BMC) 1
CH - A
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
CH - B
801PP
ESS BUS
2HA1
3HA1
202PP
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
Bleed Monitoring Computer (BMC) 2
CH - A
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
CH - B
2HA2
204PP
3HA2
802PP

ACSC: Air Conditioning System Controller
APU: Auxiliary Power Unit
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit

CMD: Command
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DLRB: Data Loading Routing Box
DMU: Data Management Unit
ECB: Electronic Control Box

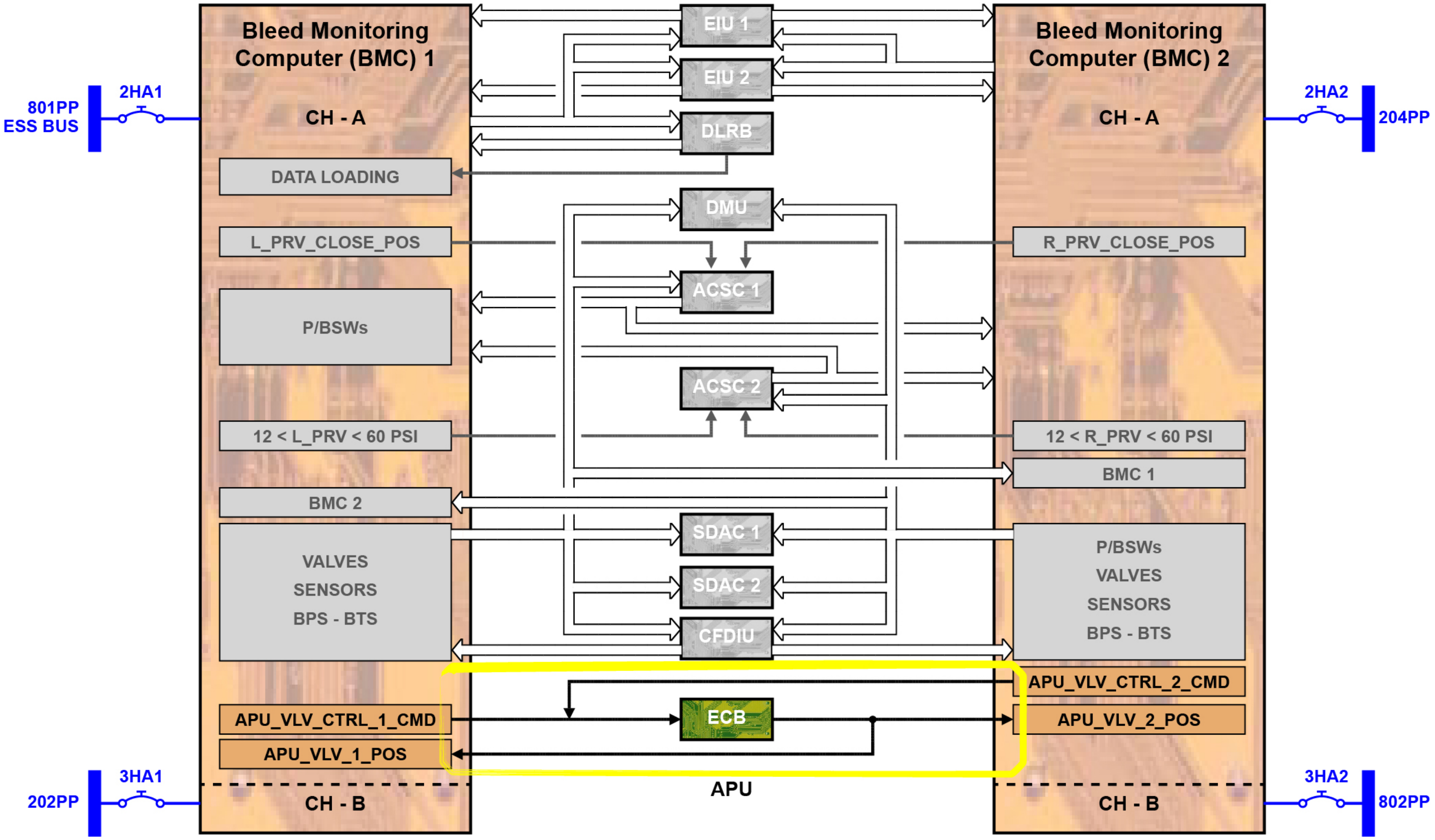
EIU: Engine Interface Unit
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

DISPLAY

BMC INTERFACES (PW1100G)

APU

The APU/Electronic Control Box (ECB) system sends to the Engine Bleed Air System EBAS/BMC the information about APU bleed valve position in order to command the PRV to close when APU BLEED P/B is ON.
The EBAS transmits to the ECB information related to the APU Bleed Valve open Command in order to provide APU Bleed valve control in when APU flow is required.


Bleed Monitoring Computer (BMC) 1
CH - A
CH - B
DATA LOADING
L_PRV_CLOSE_POS
P/BSWs
12 < L_PRV < 60 PSI
BMC 2
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_1_CMD
APU_VLV_1_POS
801PP
ESS BUS
2HA1
3HA1
202PP
EIU 1
EIU 2
DLRB
DMU
ACSC 1
ACSC 2
SDAC 1
SDAC 2
CFDIU
ECB
APU
Bleed Monitoring Computer (BMC) 2
R_PRV_CLOSE_POS
12 < R_PRV < 60 PSI
BMC 1
P/BSWs
VALVES
SENSORS
BPS - BTS
APU_VLV_CTRL_2_CMD
APU_VLV_2_POS
2HA2
204PP
3HA2
802PP

ACSC: Air Conditioning System Controller	CMD: Command	EIU: Engine Interface Unit
APU: Auxiliary Power Unit	CTRL: Control	PRV: Pressure Regulating Valve
BPS: Bleed Pressure Sensor	DLRB: Data Loading Routing Box	SDAC: System Data Acquisition Concentrator
BTS: Bleed Temperature Sensor	DMU: Data Management Unit	VLV: Valve
CFDIU: Centralized Fault Display Interface Unit	ECB: Electronic Control Box	

APU

PNEUMATIC LEAK DETECTION SYSTEM D/O

ROUTING

The leak detection system is used to detect leaks in the vicinity of the packs, wings, pylons and APU hot air ducts.
There are two independent loops as redundancy in both pylons and both wing sides.
The APU hot air duct is monitored by a single loop.
Protected areas with double loop for:
- Engine 1 and Engine 2 pylons,
- RH wing and pack 2,
- LH wing, pack 1 and mid fuselage APU duct.

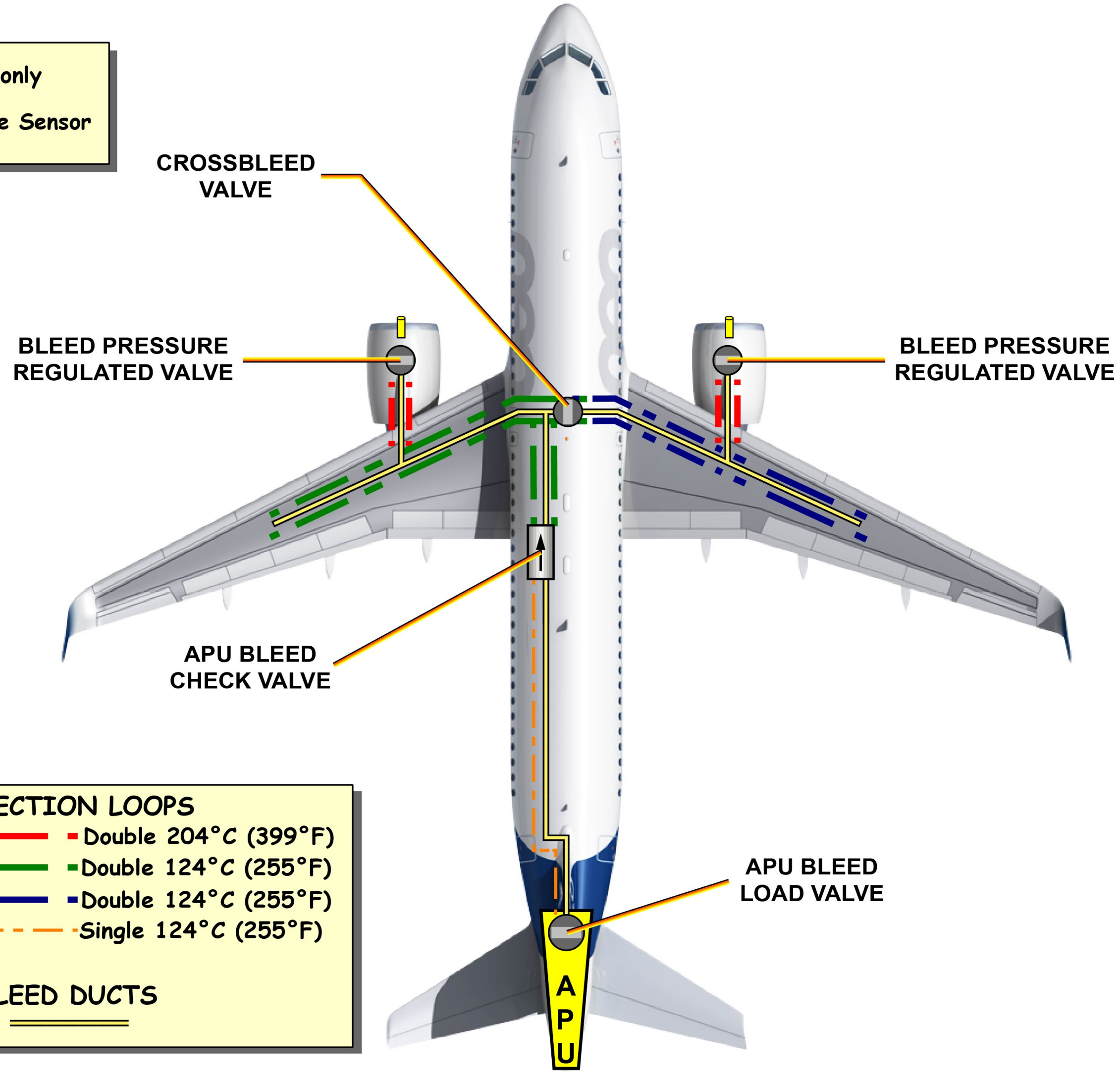
Protected areas with single loop for:
- APU duct.

NOTE: Each loop consists of sensing elements connected in series. Both extremities of the overheat detection loop are connected to the BMC.

For CFM LEAP only, the Engine Nacelle Core Temperature sensor measures the temperature within the core cowling near the ECS ducting. This signal is used to indicate an undercowl leak (overheat and/or burst duct events).

On CFM LEAP only

▮ Core Temperature Sensor


CROSSBLEED VALVE
BLEED PRESSURE REGULATED VALVE
BLEED PRESSURE REGULATED VALVE
APU BLEED CHECK VALVE
APU BLEED LOAD VALVE
APU

DETECTION LOOPS

Pylon	🟥	Double 204°C (399°F)
L wing L pack	🟩	Double 124°C (255°F)
R wing R pack	🟦	Double 124°C (255°F)
APU	🟧	Single 124°C (255°F)

BLEED DUCTS ═

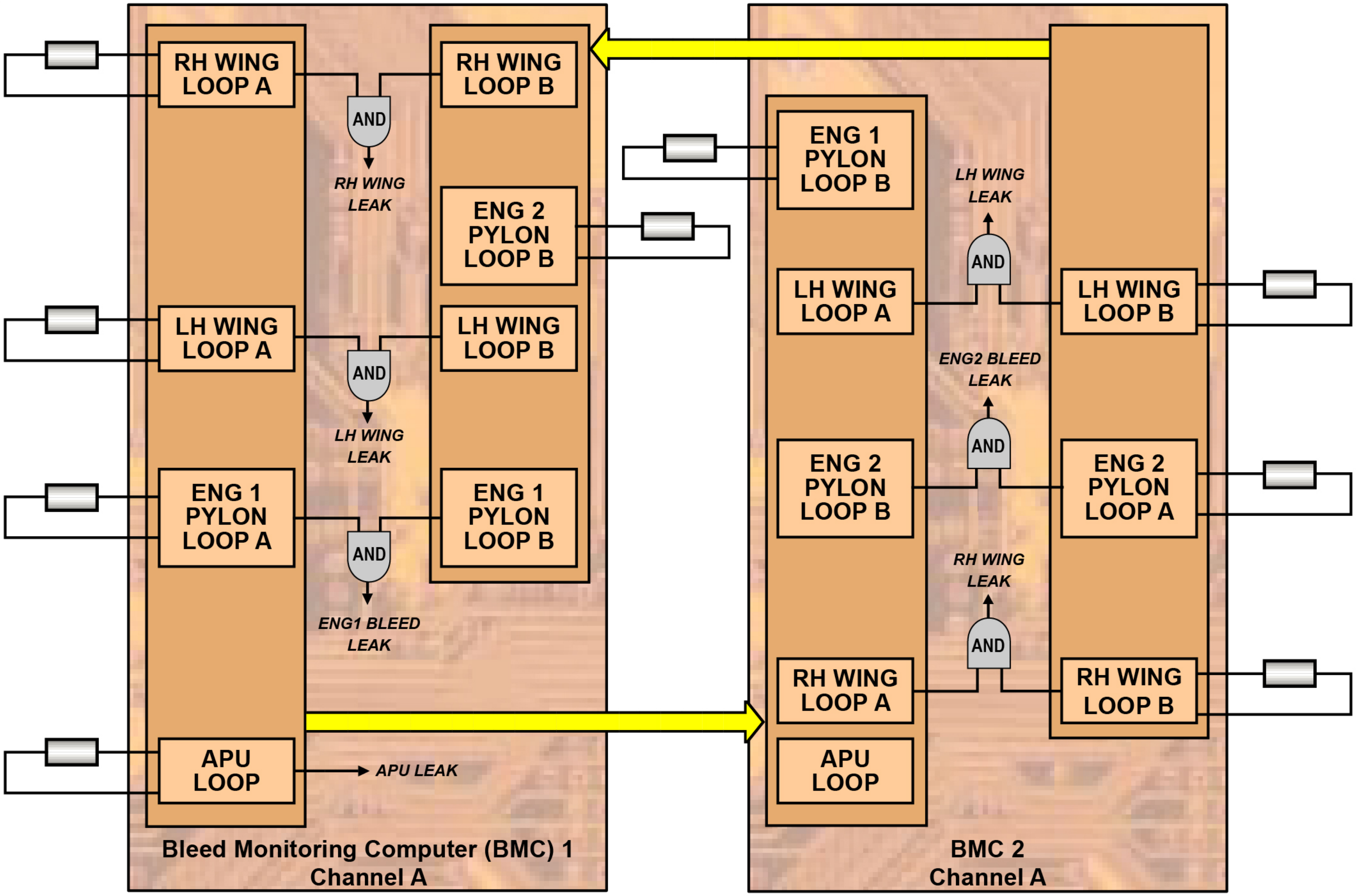
ROUTING

PNEUMATIC LEAK DETECTION SYSTEM D/O

DETECTION LOGIC

Both Bleed Monitoring Computers (BMCs) permanently receive signals from the leak detection loops primarily tested at power-up.
They exchange data via an ARINC bus for the double loop detection.
Each BMC channel A normally controls its side engine bleed air system, so monitors the OverHeat Detection System (OHDS).

NOTE: The wing and pylon loops A are connected to one BMC and wing and pylon loops B to the other BMC.
The crosstalk bus allows wing leak warnings to be activated through an AND logic. The APU loop is connected to BMC 1 only.


RH WING LOOP A
RH WING LOOP B
AND
RH WING LEAK
ENG 2 PYLON LOOP B
LH WING LOOP A
LH WING LOOP B
AND
LH WING LEAK
ENG 1 PYLON LOOP A
ENG 1 PYLON LOOP B
AND
ENG1 BLEED LEAK
APU LOOP
APU LEAK
Bleed Monitoring Computer (BMC) 1
Channel A
ENG 1 PYLON LOOP B
LH WING LEAK
AND
LH WING LOOP A
LH WING LOOP B
ENG2 BLEED LEAK
AND
ENG 2 PYLON LOOP B
ENG 2 PYLON LOOP A
RH WING LEAK
AND
RH WING LOOP A
RH WING LOOP B
APU LOOP
BMC 2
Channel A

DETECTION LOGIC

PNEUMATIC LEAK DETECTION SYSTEM D/O

WARNING CONSEQUENCES

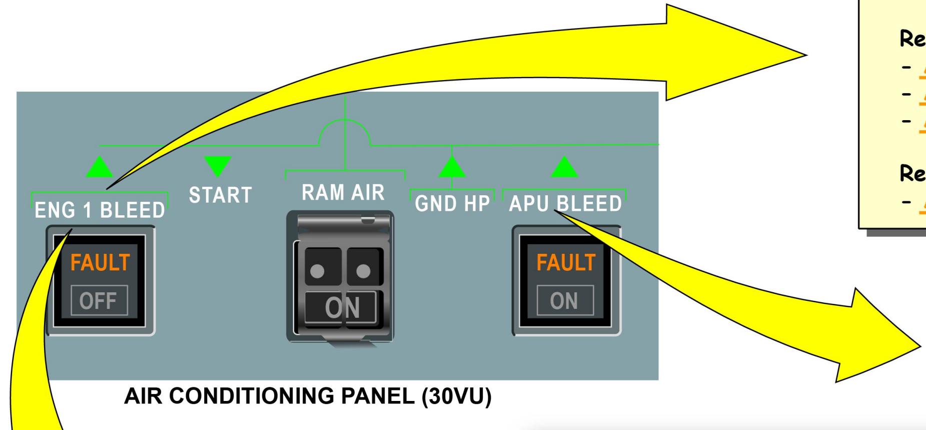
The ENG BLEED FAULT light comes on when a leak is detected by the wing loops A and B or by the pylon loops A and B.
For CFM LEAP Engine only, it illuminates if Fan Duct Burst is detected.
The APU BLEED FAULT light comes on when an APU duct leak is detected.
When an overheat condition is detected by both loops, the following alerts are generated for the affected zone:
- AIR ENG 1(2) LEAK for a leak/overheat detected in the Pylons,
- AIR L(R) WING LEAK for a leak/overheat detected in the Wings,
- AIR APU LEAK for a leak/overheat detected in the APU line,
- AIR APU LEAK [APU LEAK FED BY ENG] for a leak/overheat detected in the APU line and the leak is automatically isolated.

A new warning alert has been introduced on the A320neo, the AIR BLEED LEAK to isolate a bleed leak in the opposite pylon to the operative bleed with manually open Crossbleed Valve.
The failure of a single loop for Pylon or Wing is identified by a MAINTENANCE message displayed on the STATUS SD page.
Dual engine loop failure is identified by the AIR ENG 1(2) LEAK DET FAULT and is NO GO.
If one BMC is failed, the other BMC takes over monitoring of the bleed system and triggers the ECAM warnings.
The aircraft dispatch is for 10 days with the BMC 1 inoperative for non-ETOPS operations provided that the Engine 1 Bleed Air System (EBAS 1) is considered inoperative and the APU leak detection loop is considered inoperative.

LEAK CONSEQUENCE

A detected leak will close associated valves, as shown on the table.
These valves are automatically controlled to close if they were open.

NOTE: APU and cross bleed (X-BLEED) valves do not close during Main Engine Start (MES).



AIR CONDITIONING PANEL (30VU)

WARNING MESSAGES:

Related to leak:
- AIR: ENG 1(2) LEAK
- AIR: L(R) WING LEAK
- AIR: BLEED LEAK

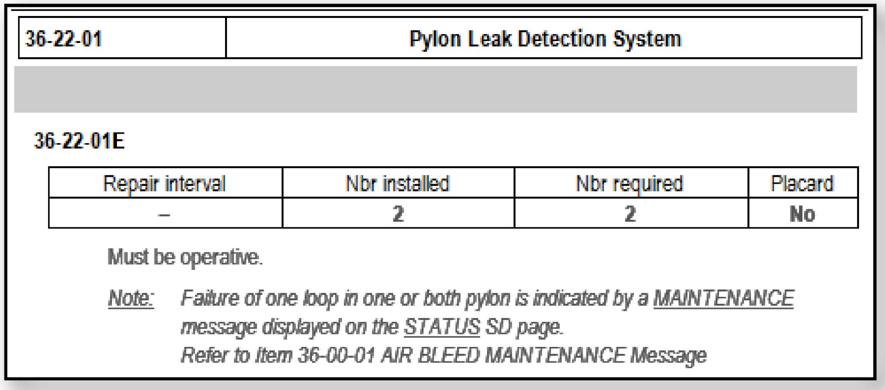
Related to other failures (e.g. Overheat, overpressure...):
- AIR: ENG 1(2) BLEED FAULT

WARNING MESSAGES:

Related to leak:
- AIR: APU LEAK
- AIR: APU LEAK [APU LEAK FED BY ENG]

WARNING MESSAGE (CFM LEAP only (*)):

Related to Fan Duct Burst:
- ENG X: HOT AIR LEAK



36-22-01	Pylon Leak Detection System

36-22-01E

Repair interval	Nbr installed	Nbr required	Placard
–	2	2	No

Must be operative.

Note: *Failure of one loop in one or both pylon is indicated by a MAINTENANCE message displayed on the STATUS SD page.*
Refer to Item 36-00-01 AIR BLEED MAINTENANCE Message

MINIMUM EQUIPMENT LIST (MEL)

TYPE OF FAILURE	ENG 1 FAULT (PYLON LEAK OR LH WING LEAK)	ENG 2 FAULT (PYLON LEAK OR RH WING LEAK)	APU LEAK (EXCEPT DURING ENGINE START)	ENG X HOT AIR LEAK *
AUTOMATIC RESPONSE/ VALVE CLOSURE	- PRV 1 - ANTI-ICE VALVE 1 - X BLEED VALVE (IN AUTO) - APU BLEED VALVE	- PRV 2 - ANTI-ICE VALVE 2 - X BLEED VALVE (IN AUTO)	- APU BLEED VALVE - X BLEED VALVE (IN AUTO)	- PRV X - APU BLEED VALVE (avoid opening XBleed Valve)

WARNING CONSEQUENCES - LEAK CONSEQUENCE

PNEUMATIC SYSTEM CONTROL AND INDICATING (3) (PW1100G / CFM LEAP1A)

Pneumatic System - General (2)

HP Ground Cart Bleed Supply (2)

APU Bleed Supply (2)

APU Bleed leak (3)

Engine Bleed supply (2)

Engine Bleed - HP/IP Switching (3)

Engine 1 Bleed Fault (HPV stuck OPEN) (3)

Wing Bleed leak (3)

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PNEUMATIC SYSTEM LINE MAINTENANCE

MEL ITEMS

EBAS MEL

The aircraft dispatch is for 10 days with the Engine Bleed Supply System inoperative on one side provided that the associated bleed is isolated by setting the:
- ENG BLEED P/BSW to OFF,
- Affected side PACK switched OFF,
- X-BLEED valve can be open to supply both sides.

The APU Bleed should be available.
One Engine Bleed Air System (EBAS) remaining available, take into account the severity of forecast icing conditions.

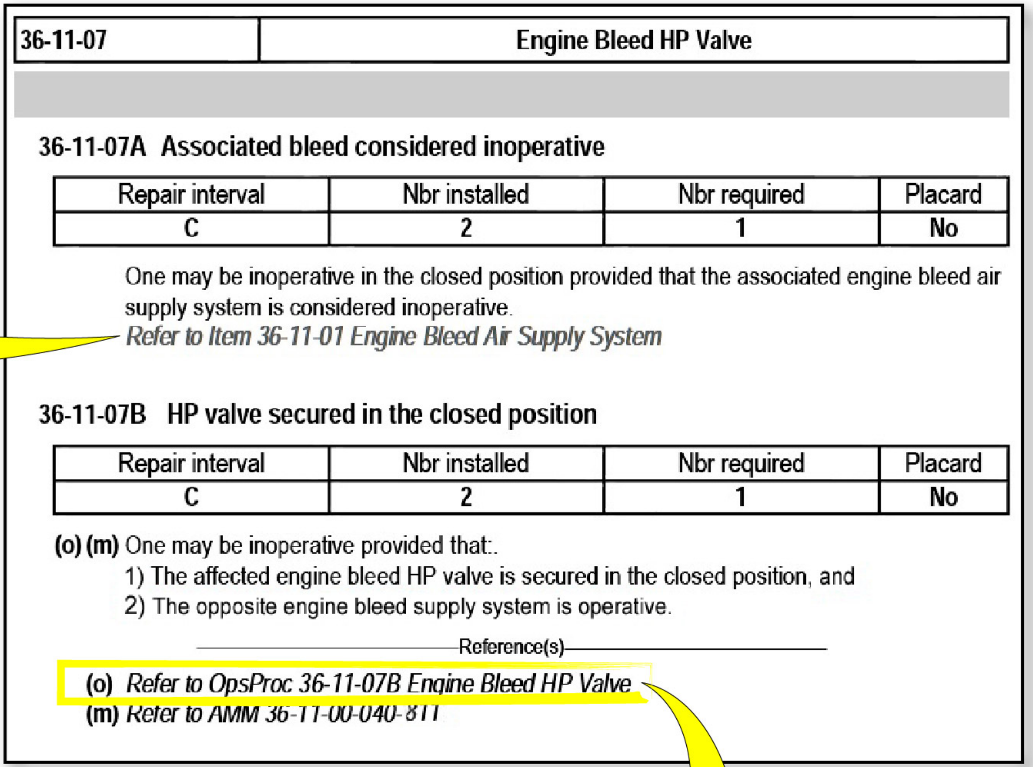
NOTE: The limitation to use only one PACK in case of single EBAS operation, is specific to A320 NEO compared to A320 CEO due to lower capacity of the heat exchanger.

HPV FAILURE

Failed closed High Pressure Valve (HPV) can lead to low bleed pressure or low bleed temperature when engine is at low power settings (in idle or in holding conditions).
HPV failed in open position, leads to Bleed overpressure or Bleed overtemperature identified by AIR ENG 1(2) BLEED FAULT.
In case of failure of one HPV, the aircraft can be dispatched for 10 days with the valve secured closed.
The consequence of having the HPV secured closed is that the bleed air from the Intermediate Pressure (IP) port will be insufficient at low engine power settings (taxi, descent, holding). That is the reason why the crew procedure requests to switch off the associated EBAS at low power setting and to open the Crossbleed Valve in order to supply both sides from the opposite EBAS which is operative.

HPV FAILED CLOSED: AIR ENG 1(2) HP VALVE FAULT

HPV FAILED OPEN: AIR ENG 1(2) BLEED FAULT



36-11-07	Engine Bleed HP Valve

36-11-07A Associated bleed considered inoperative

Repair interval	Nbr installed	Nbr required	Placard
C	2	1	No

One may be inoperative in the closed position provided that the associated engine bleed air supply system is considered inoperative.

Refer to Item 36-11-01 Engine Bleed Air Supply System

36-11-07B HP valve secured in the closed position

Repair interval	Nbr installed	Nbr required	Placard
C	2	1	No

(o) (m) One may be inoperative provided that:.

1) The affected engine bleed HP valve is secured in the closed position, and
2) The opposite engine bleed supply system is operative.

Reference(s)

(o) *Refer to OpsProc 36-11-07B Engine Bleed HP Valve*
(m) *Refer to AMM 36-11-00-040-811*

MMEL 36-11-01 Engine Bleed Air Supply System
One may be inoperative provided affected side:
- BLEED P/BSW..........OFF
- PACK P/BSW...........OFF

At low engine power settings, affected side ENG BLEED and PACK P/Bs are set to OFF and X BLEED selector is set to OPEN.

At higher power settings, affected side ENG BLEED and PACK P/Bs are set back ON and X BLEED selector is set to AUTO.

MEL ITEMS - EBAS MEL & HPV FAILURE

PNEUMATIC SYSTEM LINE MAINTENANCE

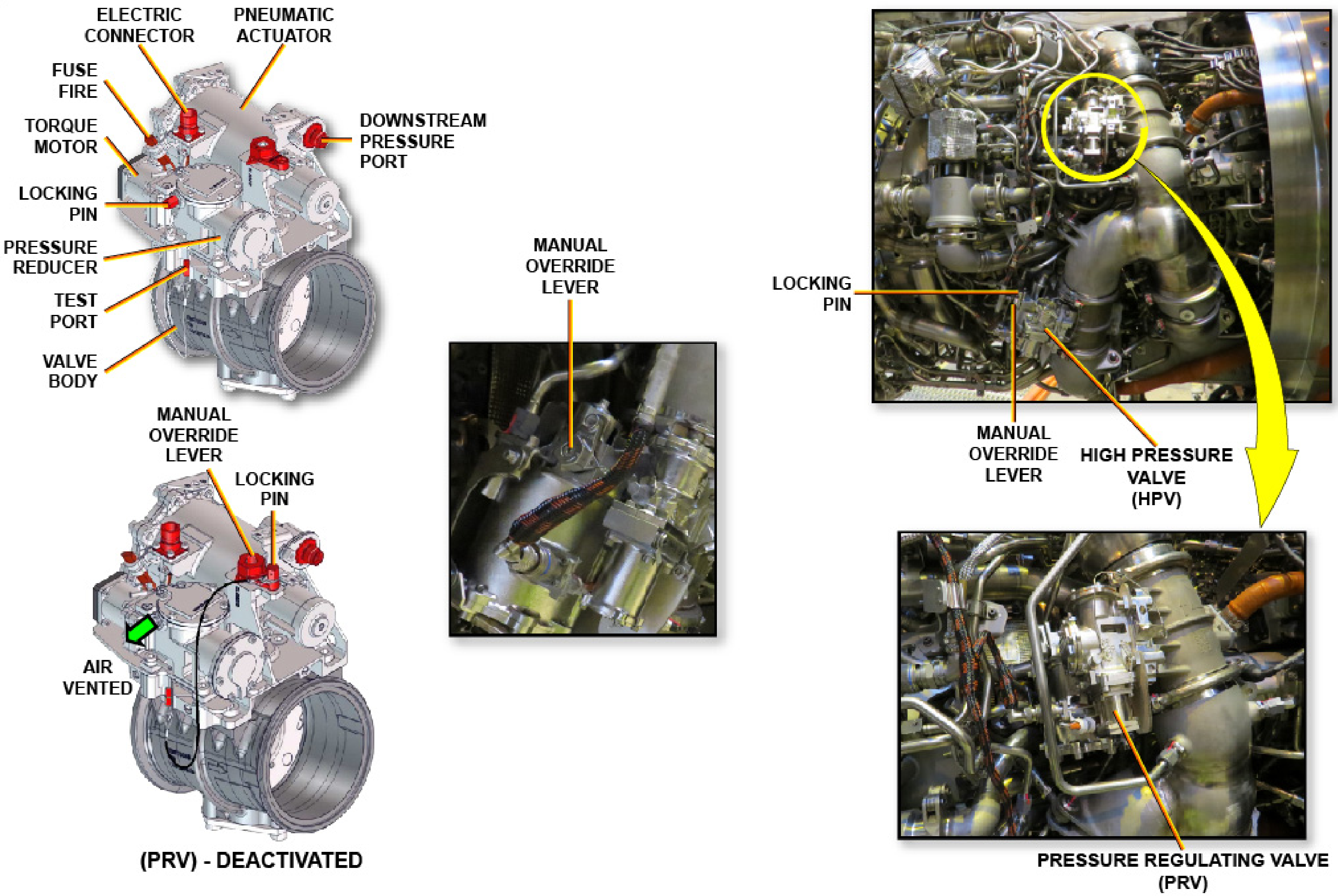
MEL ITEMS (continued)

BLEED VALVE DEACTIVATION

In case of failure, Pressure Regulating Valve (PRV) and HPV have to be deactivated CLOSED for dispatch under Minimum Equipment List (MEL).

The deactivation procedure is the same for both valves:

- make sure pneumatic system in not pressurized, BLEED switches OFF,
- deactivate the thrust reverser,
- open the RH fan and reverser cowls,
- move the manual override to the CLOSED position,
- secure in CLOSED position with locking pin,
- close cowlings,
- reactivate the thrust reverser.


ELECTRIC CONNECTOR
PNEUMATIC ACTUATOR
FUSE FIRE
TORQUE MOTOR
DOWNSTREAM PRESSURE PORT
LOCKING PIN
PRESSURE REDUCER
TEST PORT
VALVE BODY
MANUAL OVERRIDE LEVER
LOCKING PIN
AIR VENTED
(PRV) - DEACTIVATED
MANUAL OVERRIDE LEVER
LOCKING PIN
MANUAL OVERRIDE LEVER
HIGH PRESSURE VALVE (HPV)
PRESSURE REGULATING VALVE (PRV)

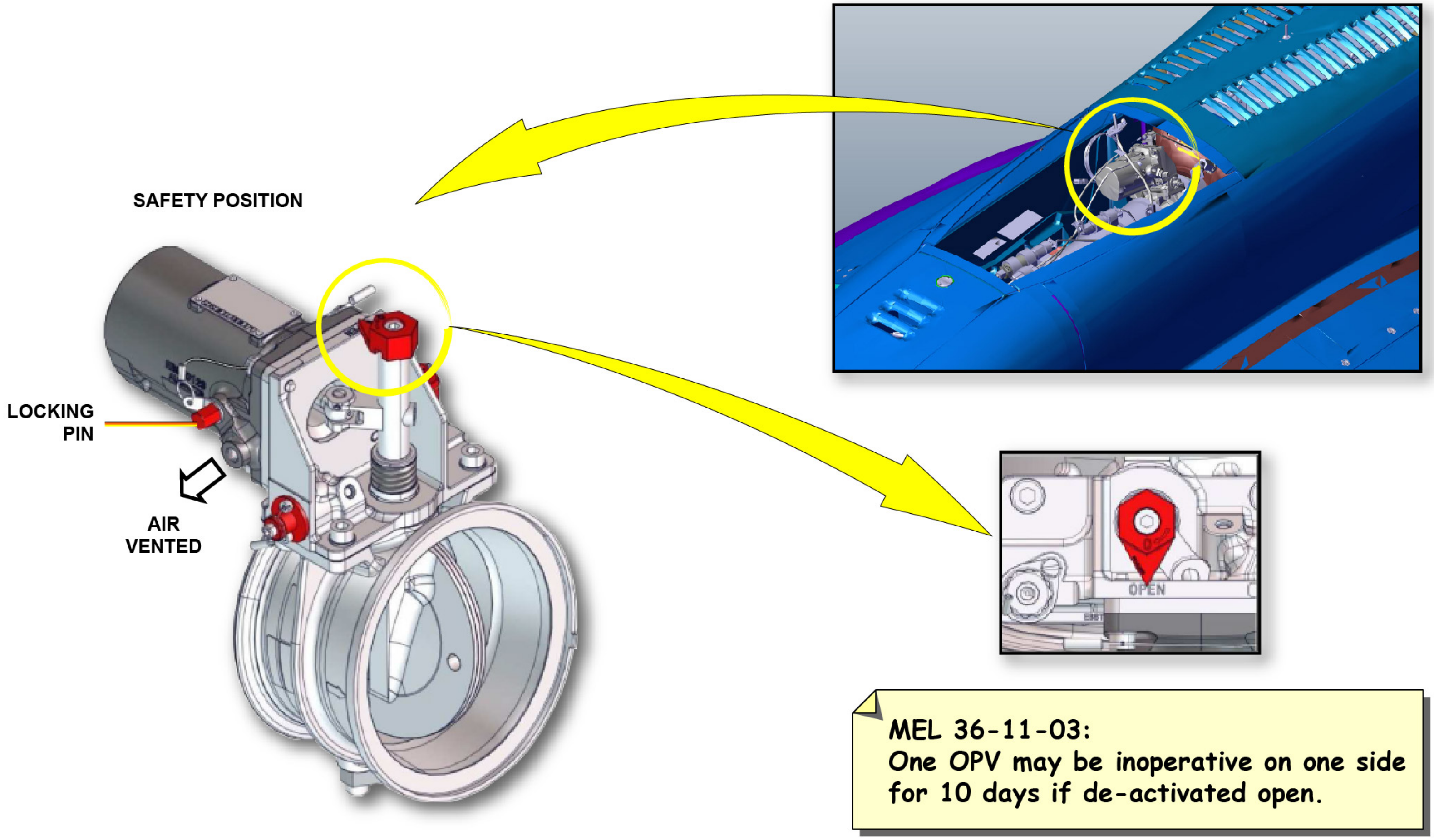
MEL ITEMS - BLEED VALVE DEACTIVATION

PNEUMATIC SYSTEM LINE MAINTENANCE

MEL ITEMS (continued)

OVERPRESSURE VALVE

Located in the Pylon, the Overpressure Valve (OPV) is fitted with a manual override and locking device which enables to lock the valve in the open position when it fails closed in order to start the engine. The position Indicator is located on the top of the OPV.


SAFETY POSITION
LOCKING PIN
AIR VENTED
OPEN

MEL 36-11-03:
One OPV may be inoperative on one side for 10 days if de-activated open.

OVERPRESSURE VALVE (OPV)

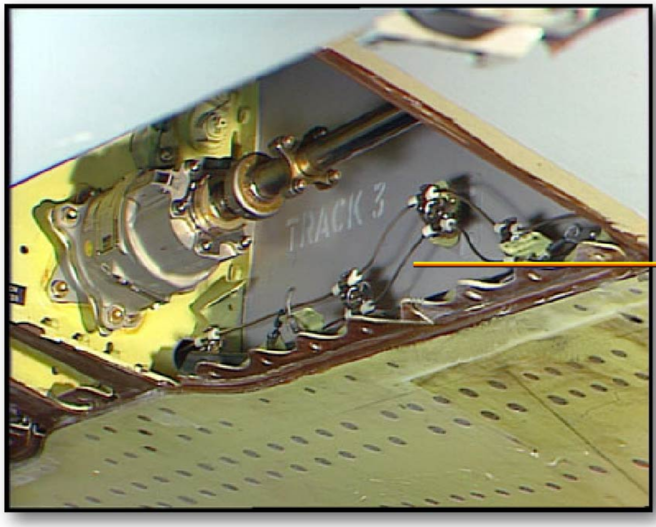
MEL ITEMS - OVERPRESSURE VALVE

PNEUMATIC SYSTEM LINE MAINTENANCE

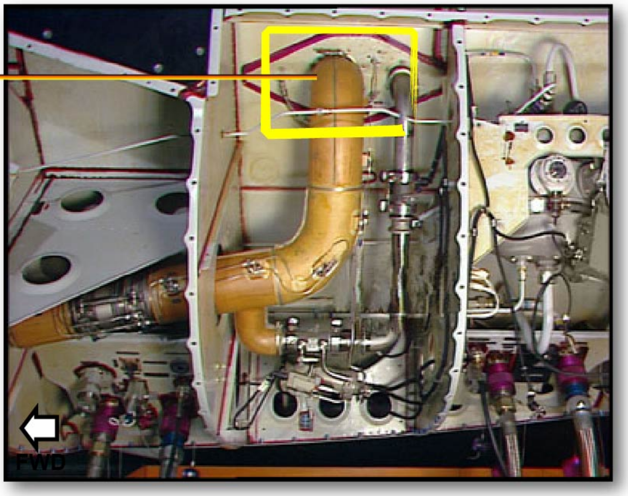
MEL ITEMS (continued)

WING LEAK DETECTION

The WING leak detection is a dual-loop system. To generate a WING LEAK warning, both A and B loops have to detect the overheat. For dispatch, WING leak detection must be operational (at least one loop) on each wing. If a single loop fails, the MAINTENANCE message AIR BLEED will be displayed on the STATUS page associated with a Centralized Fault Display System (CFDS) message L(R) WING LOOP (INOP). The aircraft may be dispatched per MEL with the MAINTENANCE message displayed.
For troubleshooting it is important to understand that the WING detection elements monitor much more than just the wings alone.
The protected areas are:
- wing leading edge (wing anti-ice supply duct),
- air conditioning compartment - belly fairing - (pack supply, crossbleed manifold, APU supply, ground air supply),
- APU forward supply duct (from the APU check valve through the wheel well).



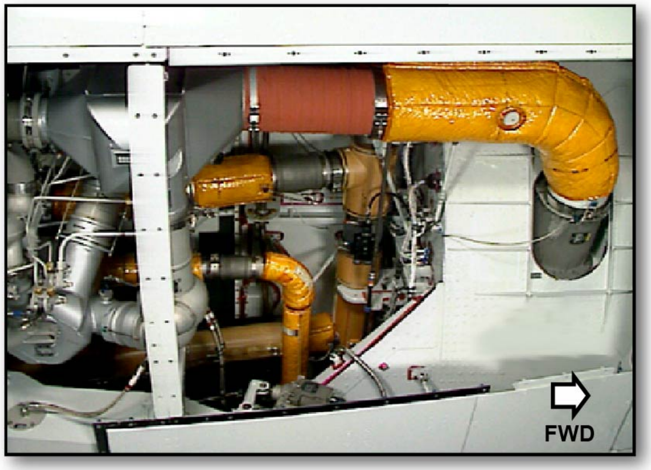
WING LEADING EDGE



FUSELAGE LEFT SIDE (AFT BELLY FAIRING)

The WING leak detection elements monitor more than the wings alone.
The protected areas are :

- Wing leading edge (wing anti-ice supply),
- Air conditioning compartment (pack supply, crossbleed manifold, APU supply, ground air supply)
- APU supply duct (from the APU check valve through the wheel well).



AIR CONDITIONING COMPARTMENT

MEL ITEMS - WING LEAK DETECTION

PNEUMATIC SYSTEM LINE MAINTENANCE

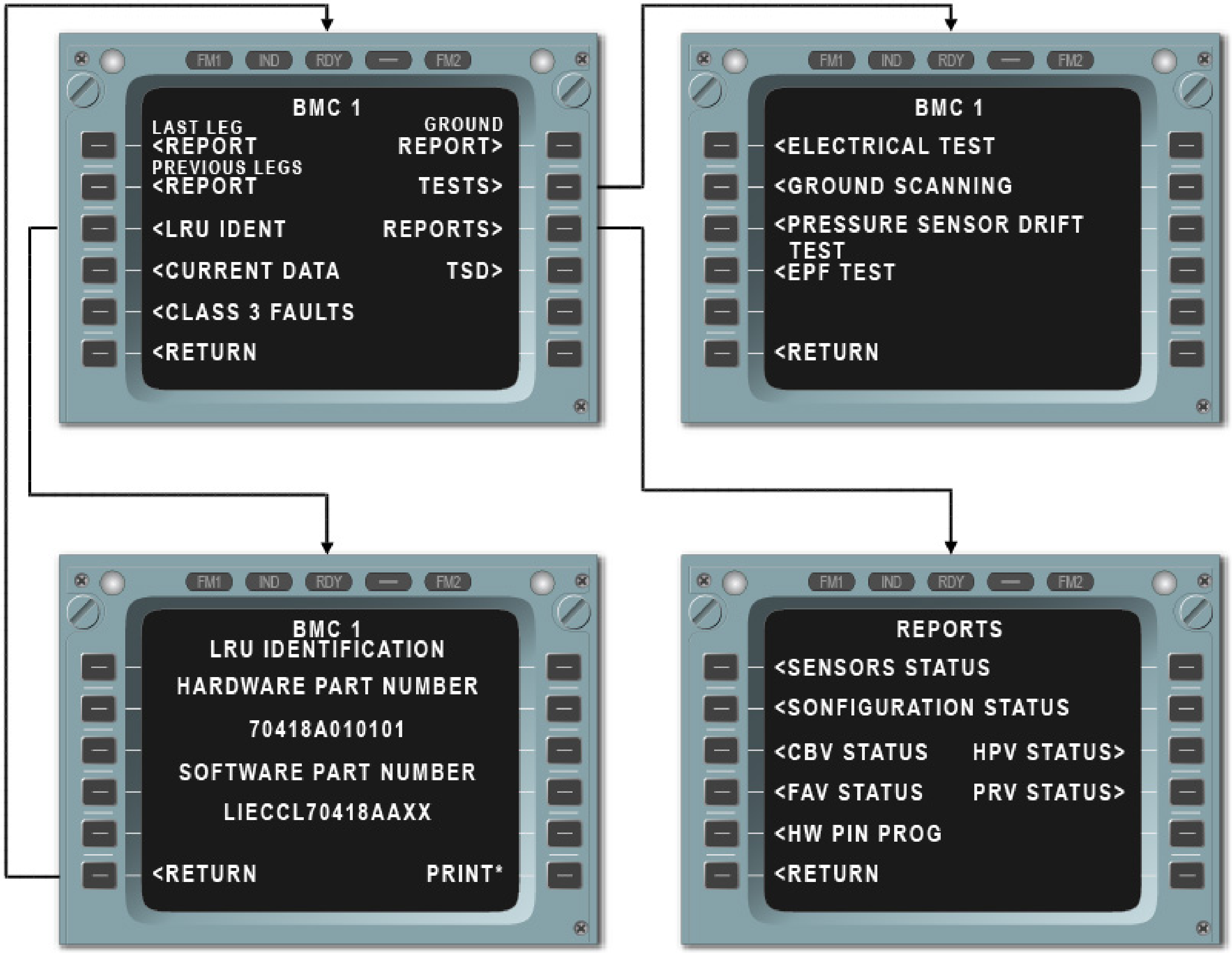
MAINTENANCE TIPS

CFDS

CFDS menus for all failure reports and interactive mode displays are generated by the Bleed Monitoring Computer (BMC) itself.
In normal mode, the BITE transmits maintenance messages (Standard A type 1) for detection results on level of:
- OverHeat Detection System (OHDS),
- Valves,
- Precooler,
- Sensors,
- External communication,
- Internal communication,
- BMC (Hardware and Software).

The electrical test verifies the EBAS following functions:
- Central Processing Unit (CPU) (microprocessor, RAM, ROM),
- discrete outputs,
- leak detection loops and interfaces,
- discrete and analog inputs,
- digital Inputs/Outputs,
- torque motors, solenoid,
- pressure sensors failures,
- temperature sensors failures,
- valves.

The pressure sensor drift test shall detect any pressure drift in Differential Pressure Sensor (DPS) and/or Bleed Pressure Sensor (BPS).
Electrical Protection System (EPS) corresponds to the channel B Electrical Protection Function (EPF) test.
The reports menu displays the status in real time for all the system.



```
             BMC 1
LAST LEG                GROUND
<REPORT                REPORT>
PREVIOUS LEGS
<REPORT                 TESTS>

<LRU IDENT            REPORTS>

<CURRENT DATA             TSD>

<CLASS 3 FAULTS

<RETURN
```

```
             BMC 1
<ELECTRICAL TEST

<GROUND SCANNING

<PRESSURE SENSOR DRIFT
 TEST
<EPF TEST


<RETURN
```

```
             BMC 1
       LRU IDENTIFICATION
     HARDWARE PART NUMBER

         70418A010101

     SOFTWARE PART NUMBER

        LIECCL70418AAXX

<RETURN                 PRINT*
```

```
            REPORTS
<SENSORS STATUS

<SONFIGURATION STATUS

<CBV STATUS       HPV STATUS>

<FAV STATUS       PRV STATUS>

<HW PIN PROG

<RETURN
```

Electrical Test possible if:
- A/C on ground AND
- Engines OFF AND
- APU not bleeding AND
- HPGC not bleeding.

The Pressure Drift Test shall detect any pressure drift in DPS and/or BPS.

BPS: Bleed Pressure Sensor
CBV: Cross Bleed Valve
DPS: Differential Pressure Sensor
EPF: Electrical Protection Function
FAV: Fan Air Valve
HPGC: High Pressure Ground Connector
HW: Hardware
LRU: Line Replaceable Unit
PRV: Pressure Regulating Valve

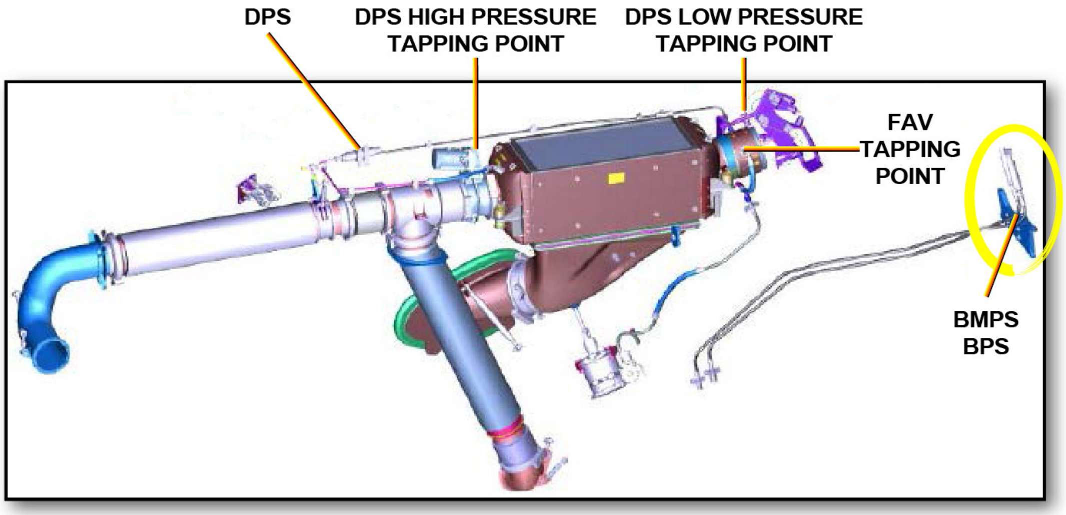
MAINTENANCE TIPS - CFDS

PNEUMATIC SYSTEM LINE MAINTENANCE

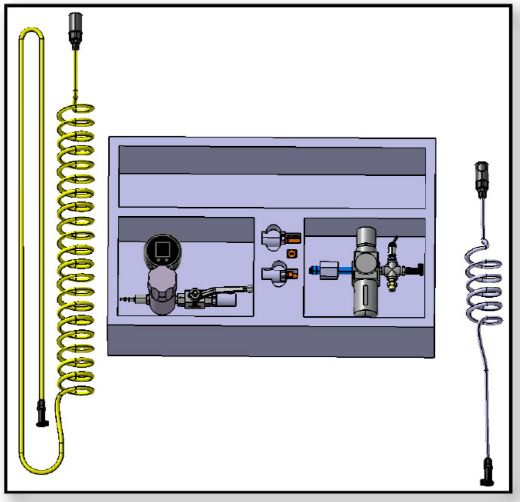
MAINTENANCE TIPS (continued)

TEST SET

The Bleed Test Set P/N 98D36109001000 is available to assist in troubleshooting the pneumatic system. The test set enables calibrated pressure to be applied to individual valves, components and isolated parts of the system to check for normal operation and sense line integrity (i.e.: PRV, HPV, OPV, Fan Air Valve (FAV), Bleed Pressure Regulated Transducer...).

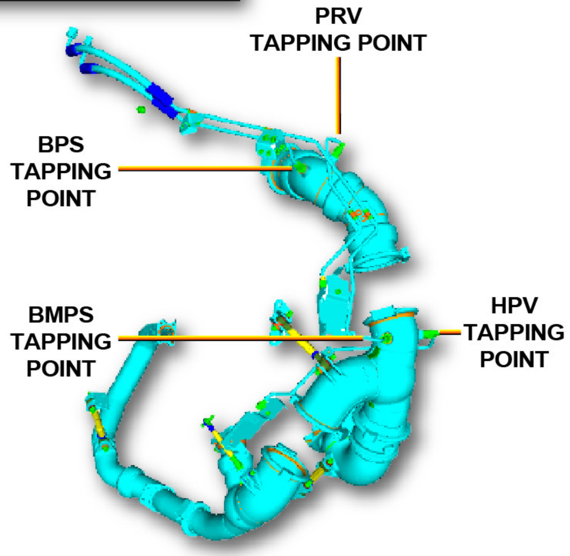

DPS
DPS HIGH PRESSURE TAPPING POINT
DPS LOW PRESSURE TAPPING POINT
FAV TAPPING POINT
BMPS BPS

SENSE LINES - PYLON



BLEED TEST SET

BMPS: Bleed Monitoring Pressure Sensor
BPS: Bleed Pressure Sensor
DPS: Differential Pressure Sensor
FAV: Fan Air Valve
HPV: High Pressure Valve
PRV: Pressure Regulating Valve


PRV TAPPING POINT
BPS TAPPING POINT
BMPS TAPPING POINT
HPV TAPPING POINT

SENSE LINES - ENGINE

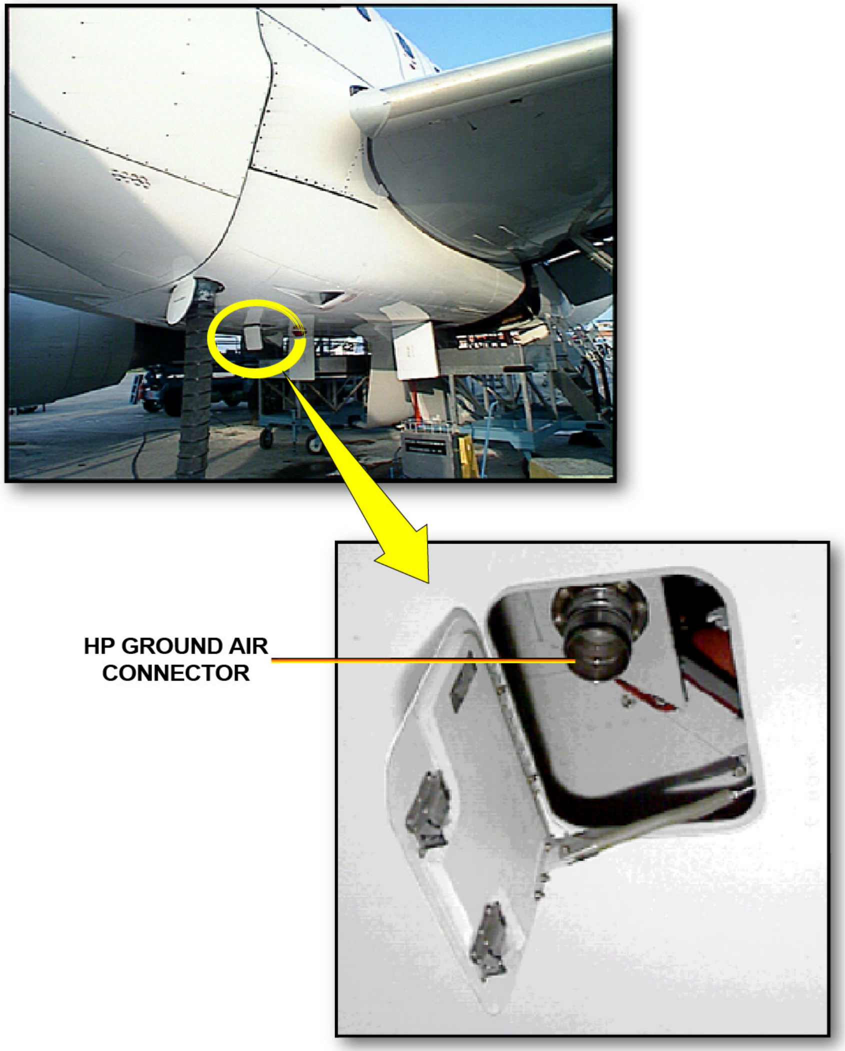
MAINTENANCE TIPS - TEST SET

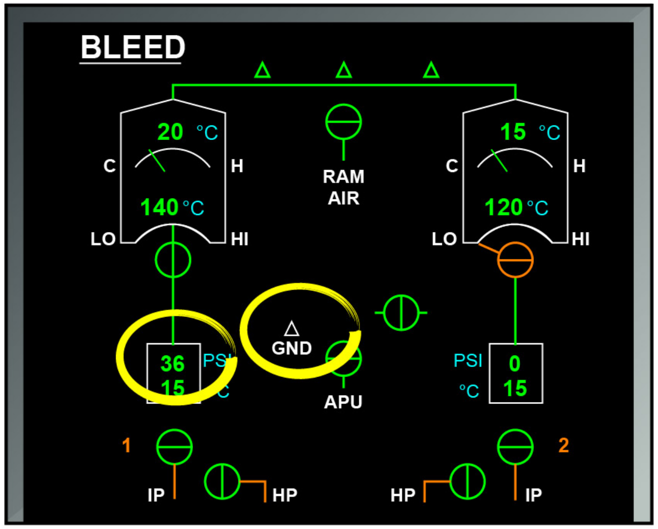
PNEUMATIC SYSTEM LINE MAINTENANCE

MAINTENANCE TIPS (continued)

ENGINE START WITH GROUND AIR

To perform an engine start with ground air, the connection is located on the lower fuselage. The access door is on the belly fairing.
During a ground air start, the crossbleed valve must be operated manually. For safety, it is recommended to use the ground air supply to start the first engine. Then disconnect the ground air supply and perform a crossbleed start for the second engine.
On the ECAM BLEED page, the GND indication DOES NOT indicate ground air supply connected or available. This indication appears when the aircraft is on the ground to show that the ground air is directly supplied to the LEFT side of the system only. The left bleed system pressure indicator will indicate pressure when the ground air is supplied.


HP GROUND AIR CONNECTOR


BLEED
20 °C
C
H
140 °C
LO
HI
RAM AIR
15 °C
C
H
120 °C
LO
HI
36 PSI
15 °C
GND
APU
PSI 0
°C 15
1
IP
HP
HP
IP
2

MAINTENANCE TIPS - ENGINE START WITH GROUND AIR

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